JOURNAL OF GAS LIGHTING & WATER SUPPLY.

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VOL. CXXIV., No. 2642.] TUESDAY, DECEMBER 30, 1913. [65TH YEAR.

1913

A Retrospect.

STANDING within earshot of the chimes of New Year's bells, the time has arrived for taking stock of the events of the year, and for examining the position of the gas industry as the result of the operations of added time. The year has been for the industry, in common with other industries and the country generally, marked by strong contrasts of light and shade; and for the gas industry particularly, it has been a full one. It has been a year of rejoicing. Following on the pleasures attending the keeping of the centenary of public gas supply, there has been the celebration of the Jubilee of the Institution of Gas Engineers; and associated with this there has been the great demonstration of progress in the applications of gas, under the title of the National Gas Exhibition, at Shepherd's Bush. Business in gas in the first half of the year was good; what it actually has been in the second part of the year has yet to be divulged by the returns. We suspect a varied tale, due to the large proportion of warm weather in weeks when, in residential districts, the domestic heating load ought to have been rising, but has not been to the extent that connections and the busy weeks experienced in the fixing of gas-fires encouraged expectation. But among the undertakings from which information has come, there has been the varied account ranging from "satisfactory" to "marking time" in the volume of the gas trading during the second half of the year. However, to take the average for the year, we are anticipating that there will not be by any means a bad showing, although not the bumper increase that an early cold season would have given. But definite information has yet to come, because it is remembered how last year many of the gas undertakings of the country made excellent increases in the summer quarter of the second half. But coal, oil, and coke are black patches on the year's record; and we are looking curiously to see the final financial effects.

The year, too, has felt the full weight of the fresh impositions made by legislative enactment upon the industries of the country; and the annual accounts of industrial undertakings such as gas supply will serve to indicate that even a Prime Minister can go astray in his views and sayings. Mr. Asquith, at Oldham recently, stated that the Government had remitted, or rather reduced, taxation which falls upon industry and the necessaries of life. The gas industry will, we believe, be able to convince him of the error of his imagination in this respect, and of the correctness of material fact. The recent report as to the percentage increase in the cost of living also tells a contrary tale.

While benefiting from the general conditions of trade (which, however, have fluctuated in comparison with the normal periods of the preceding year), in common with the rest of the country the gas industry has felt the effects of the general unrest and the dearness of money—unrest not only at home but over the seas. There has been no big war abroad, nor a big strike at home; but there has been a perpetual seething throughout the year. Uncertainty has, therefore, been dominant and unsettling; and the rays of sunshine that have fallen upon the scene have been too ephemeral to mitigate, for any very material period, the succession of blighting influences upon the general conditions. The primary elements in the general discomposure have been the long drawn-out Balkan difficulty (which did not reach a conclusion until well into the depths of the year), the Mexican troubles, clouds in China, South African labour and other difficulties, disastrous floods in America, and the defeat of the French Government. At home in the political world, the contributions to uncertainty have been the Home Rule question, the Welsh Church Disestablishment, the Franchise Bill, the land question, and national insurance dissatisfaction. The railway world has been perturbed over the question of rates, and the appointment of a Royal Commission on the subject, as well as by the labour troubles and the breaking of agreements, and tragic accidents. Throughout the year there have been labour troubles of comparatively small importance, but within them all the essentials for producing a disturbance of the national peace. All the efforts of the Government to provide machinery to avert these disasters to the country's well-being are proving ineffectual; and labour seems to-day more disposed than ever to flout arbitration and conciliation schemes, as well as agreements, and to assert itself by an extended combined force, so widening the area of the paralyzing influences of a withdrawal of labour. The unrest has been exemplified by several difficulties with the railway men, by local troubles in the coal-fields, by the threatenings of postal employees, by the pressure exerted by municipal employees acting in concert, as illustrated by Leeds, with the menace of the same thing hanging over Manchester and Liverpool, and by many smaller strikes—down to the bakers' and confectioners' men and the hotel and restaurant staffs in London.

The combination of all these events and the general unrest at home and abroad have had their effects on the Money and Stock Markets. The Bank rate was held up to 5 per cent. until April; then for a brief period it dropped to 4½ per cent.; but by the autumn it was back again to 5 per cent. Consols continued to shrink. During 1911 they were bad enough in respect of their market valuation; in 1912 they were worse; and in 1913 they have not improved their position, but show a further descent. They have, in the course of the year, made fitful attempts to recover; but in the final event unsuccessfully, for, whereas the year opened with them at between 74 and 75, towards the close they stand at 71⅞ to 72—the worst price of the year being a fraction over 71. Other gilt-edged securities have suffered much a like fate; and the general result is depression all round, in which the gas industry—despite the maintenance of dividends, and its strong position generally—has been involved in common with other popular investments. If we compare at the time of writing our stock and share list of market values with that of the first number of the year, the gains are the exception, and reduced values are found almost from beginning to end. But there is a sense of satisfaction in that, generally speaking, in the stocks of the home, continental, and remoter gas undertakings, the shrinkages in values compared with the top gilt-edged and other industrial securities have been of small amount—varying from a fraction of 1 per cent. up to 3, 4, and 5 per cent.—this applying to debenture, preference, and ordinary stocks alike. But there is a little brightening up at the close, probably in anticipation of the half-year's dividends. The Brentford Company stands a bold exception to the rule, having added flesh to the prices of their heavy stocks to the extent of 5. The cloud of discredit under which the Alliance and Dublin Company seem to be irresistibly existing is shown by a drop of about 15 since the beginning of the year. We cannot understand the continued depreciation of the market values of the Brighton and Hove Company's stocks, in view of the healthy position of the undertaking. This year their original stock has receded a further 9 points, and the "A" stock by 3. With a small drop in their ordinary stock, the Gaslight and Coke Company's 3½ per cent. maximum and the 4 per cent. preference have shed 8 and 7 points respectively. The Liverpool "A" and "B" stocks have made a backward move by 13 and 15 respectively. Sheffield has also shifted down by 9. South Metropolitan ordinary is worse on the year by about 7; and South Shields by about 6.

But these are all exceptions; the bulk of the stocks in our list exhibiting smaller declensions. Imperial Continental ordinary stock has had a set-back of about 8, and Continental Union preference of 6. Apart from outside influences, it is certain that the investing public are not now looking with favour on low interest-bearing debenture or preference stocks, nor low maximum dividend stocks. Nor

are they generally favourable to the heavy-priced unconverted stocks to which some gas companies still cling. Had the Brighton, Liverpool, and Sheffield stocks been consolidated and converted on say a 5 per cent. basis, the descent of the market values would have worn a lighter appearance. However, market values (the decline in which is generally of comparatively small amount and merely a movement in sympathy with a common tendency) are no criterion of intrinsic value. The dividends earned and paid, and the activity that has been in evidence during the year in works' extensions to meet the growth of business and the prospective demand (which enlarged connection and the extension of the variety of application predict), together supply a more reliable basis for estimating actual present value and prospects.

Apart from Stock Exchange business in gas capital, there has been a large additional distribution of stocks and shares by auction and tender. Messrs. A. & W. Richards have been as usual very prominent, through their periodical sales, in the work of disposing of fresh issues and privately held stocks and shares. They inform us that, with scarcely an exception, they have sold everything offered, whether in the form of new issues of capital or of old stocks and shares being realized by executors and other private owners. The firm add: "With heavy depreciation prevailing in all investment markets, it could not be expected that gas stocks would remain unaffected; and prices have exhibited a setback from the figures prevailing during 1912. The easing off in values, however, has been slight when compared with the falls in every other direction; and, on the whole, gas stocks have shown a stability which reflects the confidence of investors in the gas industry."

The Commercial Situation.

Looking around, the year has hardened faith in the gas industry. Its progress is inevitable, because changing view and changing demands have provided for it fresh scope in which to develop itself. Everything has contributed to the shaping of its resources to fresh and extended lines of business operation and service to the community and to manufacturing enterprise. There is nothing within sight that can hold it back. Competition has been stronger than ever during the year, and will not lessen in the future. Coal has been dear, partly due to the position of trade, partly to the influence of foreign demand giving support to the holding-up of prices at home, and partly to the appetite of the coalowners for extraordinary profits while opportunity has placed them in an abnormally strong position—an opportunity that commenced with the denuding of the country of coal stock and the belating of the fulfilment of orders by the great and protracted strike in 1912. Oil, too, has been an adverse influence in the situation; and so has coke, which has not followed the ordinary course of maintaining a high price through good demand when coal commands high rates, which shows that the position of the latter in regard to price is an abnormal and, in one sense, a fictitious one. The returns may show increases on output and sale; but this is partly the effect of the great strike. These detrimental factors cannot be, to their present extent, permanent. In the turn of the wheel of industrial fortune, we have had high coal prices before, and low coke prices, with a plethora of stock of the latter. And the wheel is bound to turn in favour of the gas industry again in all respects, though we do not look hopefully for a return to the low prices of coal of some few years ago. Birth has been given to other causes to prevent this.

Withal, the outlook of the industry is good. During the year there has been an unerring following of the high road to greater progress and service. The diversity of application grows; and everywhere where undertakings are, progressive work is actively going forward to increase connections for both domestic and industrial purposes. With the propaganda work local and general—in the latter of which the British Commercial Gas Association have taken such prominent part—the development goes on apace, and, in quite a natural way, new connections beget further ones. We have noticed how considerable is the attention that is now bestowed upon enlarging business among existing customers, this being an extension of trading that can be cultivated on a low capital expenditure. Apart, too, from new property, a good deal of attention, it is observed, is paid by some undertakings to users of electricity for lighting. It is a good thing to get gas into the houses of electricity consumers for purposes other than lighting; for the mere presence of pipes there, and the convenience and efficiency of gas for these other purposes, together with its reliability, are sometimes found to induce, at any rate, partial restoration of gas for illuminating purposes. There is one town that has a larger proportion of householder electricity consumers for lighting purposes than any other of equal size of which we know, and the gas engineer there can boast that in nearly every one of the electricity supplied houses gas is used for some purpose. An investigation of the district of the Brentford Gas Company brought to light the interesting fact that 90 per cent. of the premises in the area are supplied with gas. The industrial business is also extending at excellent rate. These developments all go along faster where there is good service combined with cheap thermal value; and the good service can only be obtained by having thoroughly trained outdoor staffs. The training of such staffs has been the subject of fairly frequent discussion—notably at the meeting of the Institution of Gas Engineers, in a paper by Mr. F. W. Goodenough, and at the North British meeting, in a paper by Mr. R. Halkett.

The result of all this excellent work is reflected by the Board of Trade returns, by the statistics under the Census of Production Act, and by those obtainable from other sources. The excellent record of the Board of Trade returns published early this year for 1911 in the case of companies and for the twelve months ending March, 1912, for local authorities will, we are confident, be exceeded for the succeeding return periods. The figures show that the gas sales of statutory undertakings were enlarged by no less than 6,212,621,000 cubic feet in comparison with the preceding year; and that more gas was made and disposed of per ton of coal carbonized. There is another thing that has been noticeable lately. For some years the addition in point of numbers to ordinary consumers has not been remarkable, but prepayment consumers have advanced in numbers with excellent speed. The tide has been on the turn in respect of ordinary consumers in connection with several undertakings. According to Field's Analysis, in 1912 the three London Companies had an aggregate increase of 45,478 consumers, and of these 7025 were of the ordinary class. The nine Suburban Companies had an increase of 18,377 consumers, and of these 4436 are supplied by ordinary meters. The balance figures indicate how continuous, on the good scale, is the increase in prepayment connections; but a more extraordinary thing is the large extra provision that the Mint has had to make to meet the demand for coppers—principally, it is asserted, through slot meters. The figures are significant of the popularity among the masses of buying in small quantities. The number of bronze pieces struck in 1911 was 40·8 millions, and in 1912 77·1 millions.

This all goes to show the vitality of the industry, and the success of its popularizing work. There have been quite a number of concerns—company and local authority—that have, during the year, registered record consumptions—at any rate, it was so during the first half, and especially in industrial centres. At the beginning of the year, it was found that the Gaslight and Coke Company had metered, during the second half of 1912, an increased sale of no less than 7·26 per cent., or in volume 920,126,000 cubic feet; and in the first half of the current year there was an increase of 3¼ per cent., which was equal to 431,933,000 cubic feet. The South Metropolitan Company in the first half of the year obtained an increase of 1·59 per cent., or 105,516,000 cubic feet. There were percentage increases of much larger order elsewhere—in the suburbs and the provinces. The same applies wherever we turn our eyes abroad—the one weak spot being South Africa. At the last meeting of the Imperial Continental Gas Association, the Chairman told the assembled shareholders that the combined stations had, in their increase of business in a single year, made up for the loss of Aix-la-Chapelle. If we turn to Australia, the last report from Melbourne spoke of a 10½ per cent. increase, and Sydney also had an increase of upwards of 10 per cent. By the British concerns operating in India and in South America the same tale is told. No matter where we look, the industry is, in regard to the extension of business, flourishing.

To good administration, and technical and commercial management, is due this excellent account of the year's gas business operations, as well as to the continuous, though gradual, improvement in the efficiency of appliances. Continuing as a matter of policy in relation to business develop-

ment and assurance of scope for the future, have been the concentration of gas enterprise and management by the annexation of outer districts, and amalgamation of smaller gas concerns with larger ones, with the cultivation of former unoccupied area. The heavy price of materials notwithstanding, notable has been the large number of undertakings that have made reductions in price during the year. This is partly due to increased business, but more to technical improvements in manufacture, whereby enhanced productive results have been secured per ton of coal, and many working economies have been effected. Sheffield ought to be specially mentioned in regard to price; for, in the course of the year, the Company have reduced their charges to 1s. 3d., 1s., and 10d. per 1000 cubic feet. The price now charged at Widnes is 1s. 1d. to ordinary consumers and 11d. to large ones. In several towns, where there is municipal management, the perennial subject of the cheapening of gas by diverting to this purpose profits now transferred in relief of the rates has been kept very much alive. The persistent agitation, we are sure, is having a good effect. It has had in Manchester, where a trial is to be given for twelve months to contributions from profits to rates on the fixed lines on the outstanding capital of $1\frac{3}{4}$ per cent. by the gas undertaking, 1 per cent. by the electricity concern, 5 per cent. by the tramways, and 2 per cent. by the markets. The liberal policy of gas undertakings in regard to the supply of fittings has also had effect; and, though there are gas men who dispute the correctness of the policy of supplying free cookers and other appliances for the purpose of enlarging gas consumption, the concerns that have adopted the policy stand steadfast by it. Glasgow made an excellent showing last financial year in the expansion of business as a direct result of the free gas appliance policy.

There were two illustrations in the course of the year of the importance more than ever to-day of having efficient technical management on gas-works. These were supplied by Devonport and Newry. If plant is not kept up to its maximum efficiency, and if the utmost is not got out of the coal, then the effect is shown in the accounts. Bad accounts at both places have resulted in the two concerns being pulled up in their downward course, and steps taken to bring about the prosperity which is to be obtained by efficiency in both management and working. Allegations of irregularities in connection with the Limerick gas undertaking brought about an inquiry by Mr. J. W. Drury, one of the Inspectors of the Irish Local Government Board; but instead of condemnation, it happily ended in congratulation.

For convenience, more than appropriateness of location in the review, it may be mentioned here that during the year the question of the allowance for depreciation in respect of income-tax cropped up several times. Some approve of the scheme that was come to by a representative Committee of Gas Companies with the Income-Tax Authorities; while others disapprove of certain features of it, forgetting that there must be two parties to a scheme of the kind. In this instance the Committee obtained the best possible from the Commissioners. A statement upon the scheme, and the scheme itself, were included in the report of the Council of the Institution of Gas Engineers. In his North British paper, Mr. J. B. Scott called attention to a very useful provision in the scheme in connection with the development of the gas business. It is this: "No depreciation shall be allowed in respect of services and fittings, but in lieu thereof, all expenditure shall be allowed as a trading expense as and when incurred." On the subject of depreciation, Dr. A. C. Humphreys submitted a very interesting paper at the Institution meeting.

Gas Undertakings and Electricity Supply.

A review of electrical matters will be made in our "Electric Supply Memoranda" next week; but there are one or two points to which reference may be made here. Despite competition, gas consumption extends; but the competition is frequently, where municipally controlled and in opposition to private gas enterprise, of a distinctly unfair character. Business is often taken from gas suppliers in connection with street lighting and public building illumination without competition; and a further injustice is done by comparing the cost of modern electricity with old-fashioned gas equipment, with inequality in the matter of the quantity of illumination afforded and hours of use. A writ has been issued by the Long Eaton Gas Company against the District Council in connection with unfair competition; and it is hoped that there will now be a definite decision given by the Courts which will act as a check and a guide to other administrators of electricity undertakings. Meanwhile, as the section of this review referring to legislative work will show, further gas undertakings have been taking steps to enter upon the business of electricity supply, and the coming session of Parliament will see others adopting the same course. One Company which will not be found mentioned elsewhere is the Jersey Gas Company, who have in hand a scheme of electricity supply for St. Heliers. The Bognor Gas Company's electricity plant was brought into use during the year. A useful paper on the subject of gas undertakings and electricity supply was read before the Scottish Junior Gas Association, in the spring, by Mr. J. W. Napier, of Alloa. Advisers have come along during the year in the persons of Mr. C. H. Wordingham and Mr. F. D. Marshall, who urged a closer alliance between the gas and electricity industries, mainly on the two grounds that the electricity industry has cut a large field for itself out of gas-lighting territory, while, on the other hand, by setting its house in order, the gas industry could be of inestimable value to the electricity industry by supplying it with the necessary cheap power in the gaseous form for generating purposes. With the expansion, actual and potential, of the gas industry, gas men are not prepared to be agitated over the place the electricity industry has made for itself; and the gas industry is now in a good position for making a strong defence against further inroads, and for recapturing some of the lost ground—given a fair field, and asking no favour. This has been proved, especially in connection with shop lighting. As for the supply of gaseous fuel for power to electricity undertakings, the work the gas industry has in hand is all shaping to the end of being in a position to do business for power purposes with anyone who desires. At the Old Silkstone Collieries near Barnsley, the surplus gas from the coke-ovens is now being used continuously for the production of some 1000 kilowatts of electricity, which is used for supply by the Yorkshire Power Company. But there are not coke-ovens all over the country, while there are gas-retorts.

Publicity Work—The B.C.G.A.

In the commercial development of the gas industry, it is absolutely essential—for educational purposes, to remove misconception and traditional error, and to keep the various services the gas industry is prepared to render well before the public—that studied and systematic publicity should be persistently carried on, both generally and locally. The administrators of the industry are regarding this matter more and more as business men, and look upon it as just as necessary as is the trained man—trained technically and commercially—to take up, in the case of the larger gas undertakings, the responsibilities of the sales department. Talking of trained gas men, it was the pleasure of the members of the British Commercial Gas Association to welcome at their annual meeting Mr. Oscar Hepgood Fogg, whose appointment as "Engineer of Utilization" by the New York Consolidated Gas Company is one of the events of the year.

Speaking of the British Commercial Gas Association, more subscribers were obtained in the course of the year; but there are many more to come in. The activity of the Association was great and seasonal during the year; but fortunately the calls upon it for dealing with defamations of gas on the part of competitors have not been so many this year. Our competitors have been convicted of lamentable ignorance, which sounds better than saying gross and deliberate misrepresentation. It is now only ignorance and want of discretion that lead to occasional foolish talk on the part of some of their representatives. The partial relief afforded by better sense prevailing among the competitors gives more time and liberty for the real work of propaganda, and of this there is plenty to be done.

The Association has stimulated far greater interest than ever existed before in the commercial work of the industry, and this alone is an excellent thing. It was seen at the annual meeting, held in the Guildhall of the City of London and at the National Gas Exhibition, over which meeting Mr. Edward Allen, M.Inst.C.E., presided. On this occasion, and at the annual dinner, there were men of all nationalities present; and in every respect—in men, material, and interest—the meeting was a great success. The address of the President, and the report made by Mr. F. W. Goodenough, told of far-reaching work, and of the continual

extension of the horizon of possibility. The papers read by Mrs. M. A. Cloudesley Brereton, Mr. Oscar Fogg, and by Mr. Thomas Waddom ought to convince, where there is not already conviction, that one thing essential to-day in the gas trading of the industry is a very high order of salesmanship, thorough organization, and the application of correct business principles. The papers by Mr. A. E. Broadberry on the application of gas to water heating, and by Mr. H. M. Thornton on the industrial applications of gas, helped to advance our knowledge of the expanse of uncultivated business land awaiting the closer attention of the gas industry. On the second day of the meeting, the three Metropolitan Gas Companies, with the Brentford Gas Company, entertained the members to luncheon, with Sir Corbet Woodall, D.Sc. (the honour of whose knighthood was conferred at the new year), in the chair. This meeting of the Association will be the last one to be presided over by a President of the Institution in virtue of the holding of that office; for the Association have determined that a commercial organization of the kind does not necessarily require a professional gas man as President. Bailie Paxton, who has been prominent in its work, is the new President, and to Glasgow the members of the Association will go for next year's meeting.

The National Gas Exhibition and Others.

The outstanding event of the year was the National Gas Exhibition, originally conceived in connection with the celebration of the Jubilee of the Institution, and which developed into a demonstration of the progress of gas application in a manner that was distinctly novel. The President of the Exhibition was Sir Corbet Woodall; and he worked hard, through personal acts and influence, in making it the magnificent success that it was. The pivot, mainspring, and we do not know what else was Mr. F. W. Goodenough, who had at his back a loyal and energetic Committee; and the man who blessed the exhibition at the opening, and who gave it his countenance on more than one occasion, was the then Lord Mayor of London, Sir David Burnett, Bart. The exhibition was co-operative in its financing, design, and execution. It only had one mission, and that was the education of the public as to what gas could do. Demonstration of application by representative types of lighting, room-heating, water-heating, cooking, industrial, and other appliances was the order of the day. The display fulfilled its dual celebration and educational purposes; and we hear of its influence, in the way of inquiries and adoption, having penetrated to quite distant parts. Its influence will not die quickly, as thousands upon thousands of the public obtained knowledge there that they did not possess before. The exhibition was so recent, and such a full description of it appeared in our columns, with reports of all the events connected with it, that this brief reference must suffice. The month of its run, let it be added, was full of life, interest, and incident; it drew to Shepherd's Bush many distinguished people, and people from all classes of the community. Its associated conferences and lectures produced much of value regarding the sciences of lighting, heating, and industrial application of gas both for heat and power. Its cookery demonstrations and competitions were popular. The halls as equipped and patronized during the month will long remain in memory. They have been, and will be, the source from which fresh knowledge of gas applications has been, and will be, carried throughout the United Kingdom—just as a stone thrown in smooth waters causes a circular rippling disturbance of the surface far from the spot where the stone falls. Many visitors from other countries visited the exhibition; and there have since appeared in their gas literature warm appreciations of the exhibition.

The South Metropolitan Gas Company made a display that attracted much attention, and elicited many encomiums, at the Ideal Home Exhibition; but a suggestion as to a display of lighting at the Anglo-American Exhibition next year has not received sufficient encouragement. Gas also had part in the Fuel, Light, and Power Exhibition at Sheffield; and in trade exhibitions in other cities. On the Continent there have been exhibitions at Antwerp, Frankfort, St. Petersburg; and a section was devoted to gas at the Ghent Exhibition. Right away in Japan, the Yamagata Gas Company had a display; being the second exhibition of which the country can boast—the first having been held at Tokio in the year 1907.

The Applications of Gas.

There have been no strikingly fresh developments during the year in connection with gas lighting, save the application of silica cups to high-pressure lamps, which impart a smart appearance and a valuable distribution of illumination, besides giving substantial relief in the matter of maintenance. Lamps of this description were one of the features of the National Gas Exhibition. All the other makers of high-pressure lamps have improved their types in various details; and the range from small units to large allows the economy of the system to be applied to open spaces, streets, large buildings, shops, and factories. The central hanging of these lamps is gaining favour from the example of the City of London; and a great deal of attention has been devoted, with success, to the provision of suitable raising and lowering gear. Various local authorities have asked, or are asking, Parliament for power to attach brackets for public lighting to private buildings, in order that central suspension may rule where desired. One outstanding event of the year was the announcement of the result of the competition at Manchester between high-pressure gas and the flame arcs. To the former there were allotted 13,500 yards of arterial thoroughfare, and 11,835 yards to flame arcs. Parade lighting continues popular; and a special article in our columns describing the remarkable work done in this direction in South London, and the popularity of the light among shopkeepers, attracted notice. Tradesmen like the light for its economy, efficiency, and excellent colour for distinguishing goods in their natural tones. In view of the large expansion of the high-pressure business, the Corporation of the City of London and the London County Council are asking Parliament in the coming session for the necessary powers of testing and stamping high-pressure meters. This is a sign of the times. At the International Road Congress, the lighting of the roads was one of the subjects of discussion, but really of little enlightenment. The draft street-lighting specification was publicly introduced at a meeting of the Illuminating Engineering Society (which Society has again done some excellent work, despite the contemptuous references to it by detractors) by Mr. A. P. Trotter, when gas and electrical men discussed it freely—the latter showing a disposition to accept it; while the former by patient attack showed good ground for its amendment. The Committee have still got it in hand, endeavouring to make it workable in a commonsense and useful manner. A description was also published in our columns of the street-lighting specification prepared by the National Electric Light Association of America. The Islington Borough Council have accepted a tender from the Gaslight and Coke Company, which shows considerable saving upon the old contract with an increase of illumination, for the lighting of the side streets. The inverted burner has enabled this to be done. High-pressure lamps have displaced electric lamps at West Bromwich. There were some excellent experiences with the automatic ignition and extinction of street gas-lamps at Wood Green, Liverpool, and other places. The economy and convenience of distance lighting and extinguishing have been so completely demonstrated, that there will be a very large passing of the lamplighter to other occupations in the immediate years. Gas flash signs are becoming more frequently observed in our streets from their adoption by tradesmen.

In regard to domestic lighting, the trend of things has been towards a more general construction of burners with porcelain hoods in place of metal ones, and with deflecting apertures, to prevent discoloration of fittings. The South Metropolitan Gas Company have justified, by a marvellous application in their area, the principle of fixed air and gas adjustment with gas that is maintained approximately constant in quality, density, and pressure. One experience is a personal one, extending over twenty-one months with nine burners, during which no cleaning or adjustment of any kind has been required, and the mantle renewals only number three. But what is particularly required to be cultivated in these days is the adoption of more decorative forms of gas-lighting; and the makers have given opportunity for the encouragement of this through handsome and more decorative fittings. The semi-indirect fitting (of which we have this year illustrated several forms) ought to become very popular in the home, as it is such a complete departure from the old style fitting. A large amount of attention has—mainly through the Illuminating Engineering Society—been given to the scientific lighting of schools, libraries, &c.; and information is spreading as to what is correct in the way of foot-

candle illumination, and as to scientific application for the protection of the eyes of students and workers. In the report of the Chief Inspector of Factories, there was a section by Mr. D. R. Wilson, recounting the results of his investigation of the lighting of foundries. The large number of flat-flame gas-burners that he discovered in use is a reflection upon the foundry owners and the gas suppliers. In those places where there was up-to-date illumination by means of inverted burners, the illumination was all that could be desired. Foundries, it is here worth noting, are places for dust-proof lamps. The Home Office has appointed a Committee to consider the question of the lighting of factories, in relation to safety and eyesight.

The study of scientific illumination has been largely taken up; and in addition to the British and American Societies, one now exists in Germany. The Photometrical Commission has emerged, from discussion and reconstitution, as the International Illumination Commission; and within the last week or two intelligence has come regarding the formation of the National Illumination Committee of Great Britain—the members being drawn from the Institution of Gas Engineers, the Illuminating Engineering Society, the Institution of Electrical Engineers, and the National Physical Laboratory. This Committee ought to do useful work, though we are not yet quite precise in our information as to what the functions of the body are to be. A suggestion was made by Mr. R. G. Shadbolt, at one of the conferences at the National Gas Exhibition, that the work of the Illuminating Engineering Society should be carried into the Provinces; and the Council of the Society are investigating the matter of a programme of conferences in suitable centres. One of the features of the meetings of the Society was the Centenary Lecture on "Gas Lighting and its Industrial Development," by Mr. W. J. Liberty. On the general subject of illumination, the year further established—through the National Gas Exhibition, the Illuminating Engineering Society, and articles in our columns—the excellent quality of gas lighting, owing to its lower intrinsic brilliancy, and the spectrum composition of the light, which combine to make it the superior of electric lighting both for the eyesight and for colour matching.

Very little need be said on the subject of gas cooking. There has been nothing in the way of additional improvement in construction to record; but Mr. F. S. Larkin has recently shown means by which ovens could be improved and rendered more efficient. He also introduced a system of heating water by coils in the oven while cooking is proceeding. Mr. Thos. Potterton has brought out a system for doing the same thing, with water-pads to the oven. Messrs. W. Sugg and Co. have introduced ovens the cubical capacity of which can be reduced for small work.

The subject of gas heating has been prolific in the production of lectures, papers, articles, and letters. It has been heard of at the Society of Arts in Cantor Lectures, it has found its way into "The Times," been before the British Association, and on to the platforms of several technical organizations. The controversy in our columns on hygienic and radiant efficiencies has brought the disputants to one way of thinking, that it is possible to secure complete hygienic efficiency without having recourse to flue-pipes, and without detrimentally affecting radiant efficiency. One firm of makers has claimed for a new fire a large gain in radiant efficiency. Dr. Leonard Hill at the National Gas Exhibition said something of which it is worth making wide use. It was: "The radiant heat from a modern gas-fire resembles, as nearly as possible, the natural conditions of sunshine out-of-doors." The coal merchants have taken alarm at the increasing popularity of gas; and they instituted a circular crusade against the progress of gas heating, by following the ancient method of people with a bad case to try to defame the rival method. They have found that they can no more stop progress in this direction than Canute could the sea waves. Investigation is now being made to ascertain whether anything can be done to improve the Leeds test for gas-fires, in order to promote both its accuracy and its usefulness. We have not heard much about surface combustion this year; but there have been several papers and lectures on the use of gas for industrial heating—particularly notable being the paper by Messrs. Smith and Walter before the Institution, Mr. H. M. Thornton's paper before the British Commercial Gas Association, an anonymous paper before the Yorkshire Junior Association, and lectures by Professor W. A. Bone, Mr. Lord, and others.

In connection with water-heating, the range of gas-heated boilers has been extended; and they are now made in suitable form for any sized property; various coke-heated circulating boilers have also been brought to notice during the year.

In the power line, the Humphrey gas-pump has been the most remarkable new application; the Chingford waterworks of the Metropolitan Water Board being the scene of the installation and working of five pumps—four of a capacity of 40 million gallons each per day, and one of a capacity of 20 millions. Professor Bertram Hopkinson has detailed the results of his work on the internal cooling of gas-engines; while both he and Mr. Dugald Clerk, D.Sc., have given accounts in the course of the year of the scientific work which has been done, and which has thrown light upon those things that help to structural economy and mechanical efficiency. There has been no great advance to chronicle in the matter of the development of the gas-turbine. It seems pretty clear that, if success is to be attained in this direction, a fundamental departure will have to be made from the lines of work hitherto pursued. If a new cycle could be discovered, so that the high thermal efficiency of the gas-engine could be combined with the mechanical advantages of the rotary turbine, gas would place a great distance between itself and competitors in taking the lead in meeting the large power requirements not only of this country but of the world.

Coal and Oil.

Coal has been not only the main raw material, but the bugbear of the gas industry during the year; for the contract prices have been about 3s. 6d. per ton more than two years ago. With a sale of (say) about 11,000 cubic feet per ton, the increase means nearly 4d. per 1000 cubic feet of gas sold. The coal owners have been roundly abused for an excessive greed for profits; but through it all, they have outwardly shown a perfect equanimity, and privately have no doubt pocketed with unfeigned enjoyment the fat dividends which have been declared by many collieries. Some of them naively say that they are now only coming into their own after a series of lean years. Figures published in one of our financial contemporaries have shown the nature of the dividends declared this year; and the well-known coal magnate, Mr. D. A. Thomas, in addressing the proprietors of one colliery company, stated that the Directors could have declared 30 per cent., but they preferred 16 per cent., having regard to dividend maintenance in the future. Sir Corbet Woodall has pointed to the unrestricted manner in which coal owners are allowed to conduct their business, contrasted with the restrictions cast about the gas industry; Mr. Charles Carpenter, D.Sc., largely blames the remission of the export tax for the present position; Mr. H. E. Jones, would like to see the gas industry become colliery owners; and Mr. Charles Hunt thinks that the coal owners and the gas industry might arrive at some mutual arrangement which would be permanently beneficial to both. In the multitude of councillors and critics, there may be wisdom; but things remain steadfastly as before. According to statistics the output in 1912—the strike year—was 260,398,578 tons, as compared with 271,876,124 tons in 1911, when people were rushing in for stock. The world is not going to starve for coal for a long distance ahead. Our fears for posterity can be shaken off. Some day even Russia may take a foremost place as a coal-producing country; for in European Russia it is computed that there are workable deposits equal to 75,000 million tons, and in Asiatic Russia 175,000 million tons. This is only an estimate. Meantime, the Kent coalfields are showing more activity; and Mr. W. R. Herring has made a test for gas-works purposes, while the Ramsgate Corporation Gas Department have a contract running for some of the coal. A good deal of attention has been given to questions of the determination of moisture in coal, and to its storage and chemical and microscopic examination. Professor Henry E. Armstrong has accused the gas profession of not knowing the carbonizing business. Labour members in Parliament introduced a Bill for the nationalization of the country's coal mines.

Regarding the course of the coal market, Durham may be taken as typical. The year opened with top figures—for bests about 16s. to 16s. 3d. February found prices at from 15s. to 15s. 6d.; and by March 14s. 3d. to 14s. 6d., with 13s. 6d. to 13s. 9d. for seconds, were the quotations. The shrinkage was only temporary; and by the beginning of May, the top prices of the year were again in existence.

But June to August saw a recession; while the succeeding months—Durham prices be it remembered—have kept round about 15s. to 15s. 6d. for bests and 14s. for seconds. During the year coke has dropped 4s. or 5s. in market value. The oil market has also been in a position that has not pleased the users of oil. With oil at 4d. and 4½d. per gallon, there is not great inducement to make extra, but there is a great inducement to make less, carburetted water gas; and this is one of the things that has affected coke stocks. Through the same cause, even in carburetted water-gas, there is in America a larger tendency towards re-establishing more coal-gas plant. In connection with oil, Professor Vivian B. Lewes's Cantor Lectures on the subject were enlightening Reverting to coal, and touching the question of railway rates, eight of the railway companies in July intimated to the colliery proprietors in Derbyshire and Nottinghamshire that they intended to increase their rates from these coal-fields by from ¾d. to 3d. per ton, according to destination, from September.

Bye-Products.

This year residuals will not show up so well as they have been doing the last year or two. As already mentioned, prices for coke have receded, and stocks have increased, which is rather unusual when coal prices are so high. A Coke Committee has been formed in London to act for the coke trade in something the same way that the Sulphate of Ammonia Committee act for the sulphate trade. They have engaged a fuel expert to advise industrial users of solid fuel; and they have entered into collaboration with the British Commercial Gas Association. There is a lot of work to be done to develop the use of coke. Two conferences on the subject have been held—one in London, the other in Manchester—to see what can be done to relieve the situation. It is generally agreed that local trade wants cultivating by advertisement and canvassing; that prices are injured by dumping into areas already overburdened by production, by panic selling, and by playing into the hands of the middlemen who sell to the retailers at prices below those that local producers are trying to realize for their coke. Hence the shrinkage of prices. The production by the coke-ovens also plays a part in the position. In 1911 at coal-carbonizing works of all kinds, there were carbonized 34,460,640 tons of coal, and 18,957,279 tons of coke were produced, of which quantity 7,483,105 tons came from gas-works and 11,474,174 tons from coke-oven plants. This tells a tale.

Concerning tar, a perpetual difficulty has been to obtain for record what are regarded by all concerned to be fair market prices—the difficulty being to get the various interests involved in tar dealings into the same boat, and to make a proper disclosure of prices realized. Some people accuse our prices of being too low; and some—even sellers—express themselves as perfectly satisfied. However, on the whole, prices have been well maintained during the year, though there was a little shrinkage below the best prices in the summer months. But at the close some of the highest prices of the year are quoted. Generally the subject of tar has been kept well to the fore in the course of the year, mainly in connection with its use for road purposes. The proper methods of preparing and applying tar for road use constitute a popular subject of discussion. The question of the injury to fish from the washings of tarred roads has cropped up two or three times; but the Board of Agriculture and Fisheries are, like ourselves, of opinion that proof is yet wanting of the alleged injury, and that there are other likely sources of the trouble. Sir James Crichton Browne made out a good case, before the Sanitary Inspectors' Association, for the use of tar, in view of the fact that dust is a carrier of disease. He also stated that there is not the remotest risk of the dissemination of cancer by the use of tar in road making. The Roads Improvement Association have been busy; and the favour of the use of tar on roads continues unabated. The "Iron and Coal Trades Review" has lately put forward a suggestion for the formation of a Tar and Benzol Committee for propaganda work.

The sulphate of ammonia position is not so healthy as it was this time last year; for there has been a break in the price, though this may be looked upon as temporary. There are reasons for this; the unfavourable harvest in 1912 being one, and another that the good price that has been ruling for sulphate of ammonia has made competition keen, and has encouraged the manufacture of other nitrogenous fertilizers. Prices ranged according to position at rather more than £14 up to £14 10s. at the opening of the year; but there was a gradual declension, until there was in May and June sulphate changing hands at from 30s. to 40s. below the figures with which the year began. Towards the close of the year, there was a brightening-up; but the figures were even then 25s. to 30s. lower than the year's opening values. It must not be forgotten that the average price of 1912—£14 7s. 9d.—was the highest for thirty years. Nitrate of soda was in the same category. While 12s. 1½d. per cwt. was being obtained for refined at the commencement of the year, 10s. 9d. or thereabouts is ruling as this is being written. There is plenty of reason here for the giving of full support to the Sulphate of Ammonia Committee by all sulphate of ammonia makers, and to it can be added the increase in production from all sources—especially from coke-ovens, only part of which are at the present time on the recovery system, and many of the others will be converted in time. There is also the recovery of nitrogen from the air; but if market values fall below a certain price, it will be impossible to make a paying proposition of the air process. Messrs. Bradbury and Hirsch and Mr. W. S. Curphey, the Chief Inspector under the Alkali Acts, did not agree as to the quantity of sulphate of ammonia produced in 1912; but it may be taken that it was in excess of 1911, despite the coal strike. Mr. Curphey in his report referred to the waste of ammoniacal liquor by small gas-works, and to the leakage of ammonia at some of the larger ones. He in his report, and Mr. Norton H. Humphrys in articles in our columns, dealt with this field for economy in gas-works operation. The International Sulphate of Ammonia Conference at the National Gas Exhibition was a great success.

A large amount of consideration has been given to the recovery of benzol from town gas by washing. It was revived by Mr. Henry L. Doherty; but the gas industry looked on the proposal, in view of their illuminating power obligations, with more amusement or indifference than seriousness. The idea was rather before its appropriate time. Though Mr. W. J. A. Butterfield has introduced some figures showing that theoretically there is profit in the idea, we have not been convinced that practically the proposal could be entertained—anyway at present.

Thoughts on the Technical Position; and Relations with Two Other Industries.

What of the technical position in regard to works and the manufacturing processes, and its bearing upon the future? The question is a difficult one. The aspects at the moment have multi-form; and it is not an easy matter to bring them into focus, and to speak assertively. Work is proceeding in many directions; and outside processes and claims are bringing their influences to bear upon our operations. Things that it was thought at one time could never enter into the industry's work have gradually come to be looked upon as cognates, and from cognates have been accepted as valuable members in gas-works' operations. The spirit of development and broader view exists in the technical manufacturing work as in the commercial work. But for the moment the pieces upon the board cannot be properly adjusted. Time alone can do this; but each year makes the future clearer. The past year has enabled the gas profession to see better through the prevailing haze than the year before; and there are certain things that can be definitely accepted. The first is, as Mr. Thomas Goulden has shown us, that the primary object of the town-gas maker must in future be the production of as many B.Th.U. as possible from each ton of coal carbonized, consistent with the limits imposed by plant and operation, and by the quality of the secondary products. As we have on more than one occasion put it, the technical men of the industry have now to think in terms of B.Th.U., as much as in cubic feet. The second point is found in the technical policy laid down by Mr. Charles Carpenter, D.Sc., that the duty of the industry is to standardize its products as much as possible, in the matters of the heating quality and purity of gas, and the quality of the residuals. The third point is one that has been particularly emphasized by Sir Corbet Woodall, Dr. W. B. Davidson, Mr. J. G. Newbigging, Mr. Isaac Carr, Mr. Harold W. Woodall, and many others, that in our manufacturing operations further economy has to be sought; and it is there to be had if proper means of realization can be discovered.

These are the three main considerations that face us at

the present time; and they must not, in the professional view of the times, be taken alone. We have to look beyond the confines of the industry's own immediate practices, and find out what other industries are doing; ascertain the effect that their plans are having, or are likely to have, upon our own course of procedure; and see whether this course can be so shaped as not only to lessen detrimental effects, but to produce additional advantage for the gas industry. The principal industries that must fall under observation in this respect are first the coke-oven industry, and, secondly, the electrical industry. In respect of the former we have seen how, though but a moderate part of the coke-ovens of the country are working under the bye-product recovery system, they are heavily supplementing the supply of secondary products in every direction. Ssve perhaps in respect of coke, the operations of the coke-oven industry have not in any way affected the gas-industry's commercial position.

What of the future? There is, under a proper system of development of demand, no reason why the coke-oven industry should adversely affect the town-gas industry. But is there no way by which the gas industry can do something to check any possible ill effects upon its own fortunes of the trading of the coke-oven industry? Birmingham, through the communications of Dr. W. B. Davidson and Mr. W. Chaney, has told us that it is possible; and Birmingham has put its belief into practice, by adopting, in its carbonizing operations, Koppers coke-oven plant to supply the demands of the industries of the city and its surroundings with the metallurgical or hard coke that is required. The results of this are that gas is provided, while a market for special coke is satisfied that would otherwise have to be supplied by plants situated at a distance, and the gas from which would not be put to such profitable use, while the ordinary Birmingham coke market is relieved of the quantity that would otherwise be produced under one of the usual systems of carbonization. This is a true economic benefit that, there is every sign, will grow in industrial centres, seeing that the local gas suppliers have the advantage over more distant coke-ovens in the matter of the disposal of their gas, as well as the benefit of creating further diversity in the demand for their products. The cultivation of trading so as to make greater the average production of profit per ton of coal carbonized must be the one important view of the gas manufacturer. The coke-oven industry is also bound in its operations by the demand that is made upon it for coke. If the gas industry can lessen this demand by, in part, adopting its processes, so much the better, too, for the sulphate of ammonia and tar markets.

We have mentioned the electrical industry. An eye must be kept upon it in reference to the developments that are likely to occur. Its professional men are gradually veering round to the opinion that the wasteful use they make of coal under steam-boilers is not economically correct. Something more perhaps might be done in offering inducements to them to make use, under present circumstances, of coke and breeze; but there is a distinct leaning on their part to the utilization of gas for generating purposes. The Diesel oil-engine has had a set-back in favour through the vagarious movements of the oil market. But opinion is anything but settled among the electrical engineers as to the course of their procedure in the future. Some of them are looking to Accrington for a lead. There Mond gas plant has been adopted, and has been extended, with sulphate of ammonia production; and the net generating costs, for the size of the station and the load, look tempting. Others again are considering the possibility in the future of a closer alliance between gas-works and the electricity station. It is conceded by some electrical engineers that the carbonization of coal and the dealing with residuals come within the province of the gas engineer and not of the electrical engineer. Mr. S. L. Pearce, of Manchester, has mentioned that there has been under consideration in connection with future extensions of the Corporation electricity plant the possibility of business relations being established between the Corporation Gas Department and the Electricity Department, and Mr. T. Roles, of Bradford, has been talking of using gas under his boilers, though we should prefer to see it employed by the more direct method in the cylinders of gas-engines. For the supply of light, heat, and power, the future may see only one purchaser of coal in bulk in any city or town. Then the electricity undertaking need take no thought for its fuel supply nor for its fuel storage, but place upon the gas undertaking the obligation to provide all that is required for the generation of electrical energy.

There may be something that, to many in both industries, appears to be visionary in all this at the present time. But the year has cleared the outlook; and a once scouted idea has become a possibility, is looked upon favourably by electrical men, and it may not be long before something will materialize in this direction. Anyway, the professional men of the gas industry must keep their eyes upon the movement, and be prepared to deal with it. The gas industry has started the process of absorption of electricity supply, or rather adding to its business by being the sole suppliers of light, heat, and power—gas and electric—in various districts; and, where this cannot be done, the consideration is as to what can be accomplished in the way of supplying gaseous fuel to electricity generating stations. Let us start off with the belief that the electricity industry is just as indispensable as the gas industry and its products; and it will assist in broadening the consideration of, and will perhaps facilitate, the closer alliance of the two industries on the manufacturing side, though not on the commercial side. The two things are totally distinct. But, from this starting-point, we realize that electrical plant needs extension, and, wearing out, has to be renewed. What is the gas industry doing in the matter of competing for the conversion of electricity generating plant to gaseous driving when extensions and renewals of the plant are required? These are a few considerations that occur as we run over the events and signs of the year.

The Carbonizing Plant.

There has been considerable activity at gas-works in the course of the year in adopting new carbonizing plant; but it is still as difficult as ever to make selection with such diversified factors in the position—ultimate economy, character of product, an eye to the future, and current local limitations. All the various systems of vertical retorts—intermittent and continuous—have now been freely adopted. Since their advent in this country, there has never been a year in which so many works have brought them into use for the first time, or have extended, or have entered into contracts for, them; and works in which they have now been incorporated are both large and small. The home contractors have been busy not only in this country, but abroad, even to the Far East, the Antipodes, at the Cape, and in America. Indeed, the British contractors are getting a large share of the work outside Germany. Speaking of Germany, it may be incidentally mentioned that during the year the Imperial Supreme Court refused to deprive the Dessau Company of their legitimate rights, and sustained their patents; but while it was our pleasure to compliment the Dessau Company upon this fact, it fell to our lot to have to criticize somewhat severely an unwarranted and covert attack that was made in our German contemporary on continuous vertical retorts, on a condition of affairs which was not normal, and which finds its reverse in the excellent experiences in numbers of other works.

A point that has been one for serious consideration by many engineers has been the life and wear and tear, in view of the somewhat heavier capital expenditure involved in vertical retorts in comparison with horizontal ones. But information on this particular point has given satisfaction, by example from St. Helens in relation to continuous retorts, and from Mariendorf, in relation to the intermittent type. At St. Helens, the original retorts have now been running about six years, with only minor repairs; and Mr. Ernst Körting, in a communication made to our columns, showed how, also with only minor repairs, Dessau retorts had had 2000 days' working life at Mariendorf, and he could not predict how much longer they were going to run. The illustrations that were given, too, showed that the deformation was absolutely negligible, notwithstanding steaming at the rear of the carbonization period. But with all the advantages shown by the continuous vertical retort in the way of uniform make, in respect of heating and illuminating quality during the carbonization period, and by all the systems the lessened trouble from naphthalene and sulphur compounds (which has an advantageous effect upon works' operations subsequent to carbonization), the improved production of sulphate of ammonia, and the higher quality of the tar and (with certain coals) the coke, there are engineers who are able to show with horizontal working under modern methods results which, in their opinion, do not justify the extra capital expenditure for vertical settings. Modern working with the horizontal retort system has indeed

narrowed the margin of advantage with the verticals; and the vertical exponents realize this. The question engineers now consider is whether the advantages offered by the vertical system outweigh the additional capital expenditure, which in its turn has to be considered in relation to upkeep, and this appears to stand well in the comparison. There is Mr. Isaac Carr who, in the interests of the maintenance of cheap gas at Widnes, has gone into the question thoroughly from the point of view of his local conditions; and he predicts, by adopting a larger section of horizontal retort and heavier charge working, the realization of a further economy upon his 4½d. per 1000 cubic feet net working cost into the holder. Nevertheless, who can say that the vertical retort will not in the course of time obtain the superior position in regard to numerical adoption?

Coke and Chamber Ovens—Gas from Colliery Plants.

A large amount of attention has been given this year to the question of the utilization by gas-works of coke or chamber ovens. The day has passed when there is talk of the disadvantages of carbonization in bulk—of varying illuminating and calorific power curves, of heavy fuel accounts, of the necessity for heavier expense in the provision of plant for the handling of material. These things in a degree all still exist; but the constructors have successfully worked to give to their bulk carbonization systems greater proximation to the needs of the gas manufacturer. The coke or chamber oven, so far as can be seen at present, will never in gas-works practice realize the vogue of the horizontal or the vertical retort. There are sufficient reasons why it will not do so. But in large works, especially in works in industrial areas, it will make for itself a good place—if present portents are correctly read. The year has given to the system testimony of a place in furthering the commercial interests of the gas industry. At home, Birmingham has supplied us, through the North British lecture by Dr. Davidson and the Institution paper by Mr. Chaney, with a graphic account of the value of the process; and from Ferndale has come information, through Mr. E. A. Franks, as to the usefulness of the coke-oven in even small gas-works—the last place where, owing to the size of the charge, its application would at one time have been considered admissible. Darwen has an oven scheme in hand; and Munich has supplied us with an amount of interesting descriptive matter. The case for chamber-ovens has also been presented in a special contribution to our columns by Mr. G. Stanley Cooper.

In the economic development of the gas industry and for reliability, it appears that, from the extent of the ability at the moment to form judgment, it is better that the industry should, where possible in industrial areas, supply metallurgical coke (although the coke-oven can be used for the production of ordinary coke, as well as the dense variety) than that it should be purchasers of gas from colliery coke-oven plants. There is a clear limit to such ability to purchase; and the constancy of supply depends on factors that do not belong to the gas industry. There, however, comes the question where coke-oven plants do exist at collieries, that it may be an economy to purchase part of the supply of gas required—gas having (as shown by Mr. J. E. Christopher by tests of gas from four distinct plants) an average net value of 510 B.Th.U. per cubic foot. However, with the sensitiveness of labour, it would never do to rely solely on a source of gas production that is not under complete control by gas undertaking. But whatever business relations may be entered into in this connection, they will have to be at a price that will tempt. We have recently seen the rejection of a scheme in the Rhondda, with purified gas offering at 7½d. per 1000 cubic feet at the ovens. The advantages and disadvantages were seriously weighed; and rejection was the result. On the other hand, report says that arrangements have been made for a supply (rumour adds at 4d. per 1000 cubic feet) of coke-oven gas to the Middlesbrough Corporation from the plant of Sir Henry Samuelson and Co., Ltd. The plant is equal to the carbonization of 4800 tons of coal per week; and as there are about 5500 cubic feet of gas available per ton of the quality required by the Corporation, this is equal to 26,400,000 cubic feet a week. It will be remembered that the Corporation are proposing the adoption of a calorific power standard in the Bill they are promoting next session. The prospect of gas from colliery coke-ovens entering largely into town supply in this country does not greatly improve with time; and there is at these plants a large development of the process of stripping the gas, and using the poor denuded resultant for heat and power purposes. Nevertheless, abroad there is a different tale. We know what is now being done in America. Not long since, we learned that in Germany some 7000 million cubic feet of coke-oven gas are now used for town supply; in the Ruhr district there are 45 towns and communes being supplied with the gas. In France and Belgium, there has been an extension of its use for the same purpose. In view of the bye-products manufacture and so forth, we believe that there would be advantage in bringing the coke-oven technical men into closer touch with the Technical Associations of the gas industry; and, holding this view, hearty welcome was given this year to Mr. Ernest F. Hooper to the presidential chair of the North of England Gas Managers' Association.

Producer Gas and the Fuel Account.

The year has given no special progress to record in connection with horizontal retort working, other than the continued expansion of heavier charge operation. Stoking machinery and the auxiliary plant—elevating, conveying, and storage—has only been improved in detail. The telpher system of distribution about gas-works has been largely extended. But in connection with retort-settings generally, there has been a reawakening of interest in their heating, and the obtaining of greater control, with incidentally a material economy. In Mr. Chaney's Institution paper, in Dr. Davidson's William Young Memorial Lecture, and in Mr. W. H. Johns' address to the Midland Junior Association, attention was called to the adoption of the Mond gas-producer for the heating of the coke-ovens at Saltley (Birmingham) works, and, with sulphate of ammonia recovery, a low heating cost was made out. The matter is worthy of larger investigation, and a close watch on experience. The producers can also be used with coke; but then comes the question whether the same economy would be shown as with the utilization of a cheap slack and sulphate of ammonia recovery. But opposed to this we have the use of primary and secondary air regulation in association with ordinary settings, and the economic effects of regulation. This is a matter that has, before this year, frequently received reference in the "Journal." To say the best, hand and optical regulation are but crude methods of controlling the primary operation in a carbonizing plant; and the three authors named have shown that, by the Brooke's system of automatic regulation, a considerable saving of fuel is effected and a greater efficiency achieved. We believe that the system is being applied to Dessau plants; and Birmingham is largely extending its application in view of the benefits that have been derived, in fuel and in the more uniform heating of the settings. Dr. Karl Bunte gave an interesting review of the developments of the heating of gas-making settings at the annual meeting of the German Association; but the information on the Birmingham experiences was not available to him at the time.

Low-Temperature Carbonization.

Different temperatures, different results. There has been much published this year regarding low-temperature carbonization; but the processes have not so far succeeded in obtaining any very noticeable footing, though there have been persistent efforts to obtain for them sympathetic consideration and trial by the gas industry. But at the present time gas engineers have not been able to find where, in view of several considerations, there is commercial advantage for them, seeing that the industry's business is to make gas and sell B.Th.U. in that form. The advantages that are held forth for the industry have about as much substance in them at the moment as the hypothetical tenant has in valuation questions. The success of the systems depends not only upon their technical perfection, but upon the creation of demands that do not at present exist to any extent, or that cannot be complied with otherwise than by low-temperature carbonization. There is one hope, and that is in the production of liquid fuel; but the commercial success of the low-temperature carbonization systems would then rely entirely upon the attitude in the oil markets of the powerful vested interests already there. However, with occasional glimpses at other systems, we have had before us during the year the Del Monte process, about the technical efficiency of which there was a good deal of comment in our

pages. Mr. W. J. A. Butterfield's report on his investigation of the process did it no good in the eyes of the public; and, if the promoters of a Company for the exploitation of the process are still living in hope, they are doing so in retirement, for little has been heard of them lately. The Richards process has been introduced to notice; and we believe that working-scale plants are to be tried at certain collieries. The system of the Premier Tarless Fuels has been the most complete one that has yet come to notice; but there again it tarries in getting away from its birthplace at Battersea. A feature of the system is that carbonization proceeds under a heavy vacuum; an oxygen-free process being considered to give best results. Mr. F. D. Marshall has been the means of introducing this system to the gas industry, and, in his Manchester University lecture, he supplied much interesting information concerning it. Regarding carbonization under a heavy vacuum, Mr. W. R. Herring has called attention to the fact that it forms part of his vertical retort process, as described in his patent specification of 1909. The British Coalite Company are apparently not yet giving up hope, for only recently there have been resolutions passed for the reorganization of the concern, and for enormously cutting-down the capital. There has never been a case, we should imagine, where the shareholders have been more completely frozen-out of their investment than in this sad piece of speculation. Those who are now trying to obtain something for them deserve to have their optimism and willingness rewarded; but we fear for the result. There has been, so far as we are aware, no coalite available this season for those householders who were supposed to be languishing for it; and, as a matter of fact, there is talk of the County of London Electric Supply Company having obtained an option for the acquisition of the Barking site.

Refractory Materials.

This subject has cropped up at intervals during the year in various ways. The attention of the gas profession was called by Mr. John West to the fact that tests were being made that were not in accordance with the specification of the Refractory Materials Committee, with the consequence that higher values were being given to certain materials than would be the case if the tests were conducted without variation from the Committee's prescription. There was fair ground here for resentment. During the year there was also complaint that the experience was not good in all cases with materials bought to the specification; and the Committee, through Mr. F. J. Bywater, reported at the Institution meeting that some of the sample materials submitted to Dr. Mellor did fall short of the standard. Mr. W. B. Randall was much dissatisfied with his experiences at Waltham Abbey; whether there has been improvement since has not transpired. Complaint was also made at the meeting of the Iron and Steel Institute that certain English-made fire-bricks had not given good results in coke-oven work. But we incline to the view that the British fire-brick makers are not in these matters all receiving fair-play. Publicity is given to indifferent experiences; but good experiences and satisfaction are being kept in the background. Among troubles to which attention has more than once been directed this year is the detrimental effect of chloride of sodium upon retorts and coke-ovens. Dr. Mellor and Dr. Lessing have contributed to the literature of the subject of refractory materials. The question of the use of silica material for carbonizing plant was raised at the Institution meeting, when report was made of excellent experiences in America. Various contributions to the subject were made at various times in our columns; and a United States patent was published by us towards the end of the year.

Water Gas.

There has been nothing of technical importance to chronicle in this connection during the year. We seem to have settled down upon definite constructural practice and working. Much better results are now being secured at some works than formerly, by paying greater attention to inspection and testing, and seeing that plants are kept tuned-up to their best efficiency. The troublesome question of the extraction of tar from water gas has been recently dealt with before the Southern Association; and it was seen that the troubles are amenable to proper treatment, and that there are more ways than one of really successful dealing with them. The question of the reduced use of plants has been mentioned in referring to the price of oil.

Purification.

After long years of comparative neglect, purification processes have combined to make a very live topic. Gas of greater purity is now demanded. Unsightly incrustations on the metal parts of inverted burners are not beneficial in creating favour; and in industry, for motive power and heating work, the demand for gas containing lower sulphur content has also been made. A cheap process for the removal of carbon bisulphide would assist in expanding the field from which coals could be purchased for gas-making purposes. From several directions we are promised a process that will be cheap, and also give high efficiency. The paper that Mr. Charles Carpenter, D.Sc., read at the meeting of the Société Technique described the Evans process, in which there is decomposition by catalytic action of carbon bisulphide to sulphuretted hydrogen—the gas being preheated before coming into contact with the catalyzer, and the sulphuretted hydrogen being removed in the ordinary way. The finished gas only contains about 8 grains of sulphur per 100 cubic feet; and this reduction is effected at a cost, including the removal of sulphuretted hydrogen, of something like 0·35d. per 1000 cubic feet for fuel, manual labour, interest, depreciation, and repairs. It is not known whether this low figure is going to be further reduced; but experience has shown how capital expenditure can be lowered and improvement effected in the heating. The process will shortly be applied to the whole of the South Metropolitan Company's gas. A very promising development of liquid purification is likely to come from Birmingham, where Dr. Davidson has been working at it, with success. The workers in ammonia purification seem hitherto to have missed what Dr. Davidson has discovered—the importance of a carefully regulated gradation of pressures in the still, in addition to the control of the temperatures. Pressure having an important influence on the solution of all gases, it is obvious that Dr. Davidson has hit upon something that will aid in the separation of ammonia, sulphuretted hydrogen, and carbon dioxide. From Heidelberg comes information as to the use of alkalinated cellulose for dealing with carbon bisulphide; and operating figures are given (see German Association meeting) that run the Evans process very close. Description has also been given of the Hultman process, which aims at the removal from gas, already freed from sulphuretted hydrogen, of carbon bisulphide, naphthalene, and benzol in a single operation. Other contributions to the subject have been provided by the Bayer process for purifying by the atomization of suitable liquids, and the Burkheiser process for eliminating sulphuretted hydrogen from gas by washing in a solution of metallic salts. Herr Feld's "Thionate" process has also been discussed. By this he claims that the cost of sulphur purification is reduced to 0·141d. per 1000 cubic feet. While mentioning purification, reference may be made to the fact that Mr. G. Scott Ram, the Chief Electrical Inspector of Factories, called attention, in his annual report, to a fatal accident that arose in a purifier-house through sparking from the electrical plant used for driving and elevating. Great care should be exercised where electricity is employed in purifier-houses, and the use of bare conductors should be prohibited.

Gasholders.

There is nothing special to record in reference to the other plant in gas-works. But allusion must be made to one or two matters associated with gasholders. The year has been free from any noticeable accident with them; and although spiral-guided holders of larger dimensions than ever have been brought into use, continued good experience is the best possible answer to all that transpired in connection with the Ilkeston disaster, which occupied considerable attention by technicians in 1912. The report of Mr. A. G. Drury who conducted the inquiry into the matter was issued early in the year; and it was clear from it that the collapse of the tank was due to the brittleness of certain of the plates. Independent analyses showed that the plates did not come within the standard specification for steel in the matter of phosphorus, though the results of tests supplied from the rolling-mills to the contractors indicated that they did. Mr. Drury's report will have a good influence in bringing about a more direct control over the quality of materials. The

report also raised the question as to the employment by purchasers of competent engineering advice regarding such structures as gasholders. A four-lift spiral holder, of 5 million cubic feet capacity, was brought into use at Oldham; this taking the lead in capacity among holders so guided. The Sydney Gas Company intend taking rank as the possessors of one of the three largest holders in the world, by having one constructed of 12 million cubic feet.

Distribution Work.

The distribution department has been receiving more attention than ever during the year. The extension of areas, and absorption by the larger gas undertakings of the smaller supply districts, have made a large amount of work in the linking-up of new areas to central manufacturing stations. High-pressure transmission has been largely resorted to in this connection; and, in discussions upon the subject, the inevitable question of suitable joints has cropped up. Welded joints have been very strongly advocated, as being in the long run the cheaper through the subsequent savings effected, although somewhat dearer in first cost. Among the useful contributions to the general subject of high-pressure transmission were the papers by Mr. Alex. A. Johnston, at the Institution meeting, and one by Mr. W. M. Valon at the Midland meeting. The towns are now increasing in number that have their high-pressure system in the main street or streets for the purpose of doing business in high-pressure lighting for shops or streets and for the supply of gas for industrial heating processes. The largest high-pressure meter yet made has come from the shops of Messrs. Parkinson and W. & B. Cowan, and has been supplied to the Mynyddislwyn District Council. A means of locating hidden pipes by a wireless principle has been devised by Mr. Edwin Mansfield. More than once this year there has been impressed upon the professionals of the industry the value and economy that are to be gained by systematic inspection of gas-distributing systems, so preventing waste and remedying any that exists, and obviating other undesirable contingencies. Through an experience of the British Gaslight Company, attention was called to the fact that lower tenders for pipes had been secured from abroad than could be obtained from pipe makers in this country. For the sake of the success of the home industry, it is hoped that there will not be much experience of this nature. One remarkable piece of work connected with the transmission of gas was the great Astoria Tunnel which our New York friends carried out. The tunnel is 21 feet high, 19 ft. 9 in. wide; and its total length including shafts is about a mile. It is for the accommodation of two 72-inch gas-pipes.

General Gas-Engineering Work.

During the year we have given many illustrated descriptions of new works or extensions of gas plant, at home and abroad, as well as articles and papers dealing with the large field that gas-works operations offer for the development of economies and the making of new discovery. Incidentally, these have shown us the several accomplishments with which the true gas engineer has to be endowed in order to be equal to the requirements of the day, with a consideration for the future. The gas engineer has to be something more than the narrow idea his title conveys. In the larger works, and in the smaller works, to greater or less degree, he has to be a capable gas engineer, mechanical engineer, transport engineer, electrical engineer, and chemist. It is a big tax on one man; and so the process of devolution of work is ever increasing, while the responsibility on the chief weighs heavier. His scope is great; and, as Mr. Goulden told the Southern Junior Association in an inspiring address, the dignity and responsibility of the gas engineer are ever increasing. We have during the year seen works concentration going on through expansion of areas, and the absorption of smaller gas undertakings—all with the view to economy and to strengthening the position of the gas industry through the reinforcing of the scope of individual undertakings. We have seen mechanical operation extending, and the face of works has become vastly changed through both this cause and the changed architectural construction that new applications have brought in their train. We cannot here individualize; the "Journal" indexes must be the guide. But over all this movement there are works economy and improved efficiency. Several papers communicated to technical organizations—the Institution and District Associations—have been directive in pointing to actual accomplishment and possibility in furthering economy. We ought to mention here as an event in gas engineering and management the issue of a new (eighth) edition of Newbigging's "Handbook."

Technical and Other Organizations.

The year has been a red-letter one for the central technical organization of the industry. The members have been celebrating the jubilee of the foundation (under the name of the British Association of Gas Managers) of the organization. It has been a year of retrospect, reminiscence, and celebration, in which celebration other kindred organizations have had part—not only home organizations, but organizations abroad. From many parts of the earth—from the Antipodes, from America, from the Continent—there came representatives of other countries to both the Institution meetings and to the National Gas Exhibition. They brought messages of congratulation and of good wishes. The honour of the presidency of the Institution and of the Exhibition fell, by every right, upon Sir Corbet Woodall, D.Sc.; and gracefully he filled the dual offices, and added to the laurels of esteem already earned among those with whom, and for whom, he has professionally laboured throughout a working lifetime. The jubilee meeting was a success in the fullest sense of the term. The President was filled with the spirit of the occasion. His address testified to the pride he felt at the position the industry occupies in the world's affairs by and through the work of those living, and of those who have passed away; and it pictured a large and extended part in service in the future. The vitality was reflected during the proceedings at the meeting, in the character of the technical work that occupied attention, and which is referred to more pointedly under the appropriate subject-matter in this review. But it all showed the high point gained, and the advancement still being searched for, in the matters of efficiency and broadening-out in every department. There is no acknowledgment in the industry of any definite confines; and there cannot be where evolution is the order of the day. There was a Jubilee Dinner; there was a presentation to the much-venerated Mr. Thomas Newbigging, D.Sc., who was one of those present at the meeting at which the central organization was actually founded; there was also presentation of the Birmingham Medal to Sir Corbet, and the entering of his name on this particular roll of honour; and there was the charming garden party at Chislehurst, at the invitation of the President and Lady Woodall. So, by these and other means, the Jubilee was celebrated, and impressed upon memory. Among other incidents at the meeting was the retirement of the Hon. Secretary, Mr. S. Y. Shoubridge, and the appointment of Mr. W. E. Price as his successor. Mr. Edward Allen was elected to follow Sir Corbet in the presidential chair; and Liverpool is to be the scene of the annual meeting next June.

There were two subjects introduced at the annual meeting to which allusion should be made—one was the setting-up from the elements in existence of a central organization representative of the entire industry, and the other the establishment of a central home for the industry's organizations. The last-named matter, it has been definitely decided, is not one that can be entertained at present; and the former is under the consideration of a Committee consisting of seven members each of the Councils of the Institution, of the Society of British Gas Industries, and of the British Commercial Gas Association. Federation and its possibilities are what they have to consider and report upon to their respective organizations. The President of the Institution is very enthusiastic on the subject.

The District Associations, their Commercial Sections (a new one has been formed in connection with the Midland Association), and the Junior Associations have during the year done excellent work, including in their proceedings some addresses by master-minds. Our columns have likewise shown that the organizations of the gas industries of other countries are similarly as full of life and vigour as are our own. The year witnessed the holding of the first annual meeting of the Imperial Gas Association of Japan. We have here a coincidence—the jubilee year at home; the inauguration meeting in Japan, where gas-works are as up-to-date as the best of those in the Western world. East congratulated West; West congratulates East.

The Society of British Gas Industries had a busy year—mainly through their co-operative work in connection with

the British Commercial Gas Association, and through the yeoman services rendered in the matter of the National Gas Exhibition. The organization has been prominent in the industry's work. At the annual meeting in March, Sir Corbet Woodall, then the occupant of the presidential chair, delivered an address on the relations of statutory and private trading enterprises. He has been succeeded in office by Professor Harold B. Dixon, whose scientific work has associated him intimately with the interests of the gas industry. At the recent meeting of the Society, the Chairman of the Council, Mr. W. D. Helps, read a paper, in which there was some very plain speaking on the subject of shareholding in trading companies by gas officials, and the reverse—shareholding in gas undertakings by private trading firms—and the effect of such holdings upon free and fair commerce.

Education and Examinations.

Speaking of the junior engineers and the work of their organizations reminds of the opportunities that are now offered them for securing the scientific foundation which is so indispensable to their life's work. Professor John W. Cobb, the occupant of the Livesey Chair at the Leeds University, has shown a desire to make the work of his department as far-reaching and practical as possible; and, to this end, he has altered the courses so as to make them easier of adoption. The research work he has also been directing into practical channels. The new holder of the Research Fellowship of the Institution of Gas Engineers is Mr. Harold Hollings, B.Sc.; and he is investigating the thermal behaviour of coal during distillation, and kindred matters. Other work proceeding at Leeds is the question of the ventilation of rooms heated and lighted by gas. The Imperial College of Science and Technology has completed its Fuel and Refractory Materials Department (of which Professor W. A. Bone is the head), and a very complete plant has been installed. A matter that has been for the present determined, after long discussion, is that of the education and examination of gas-fitters. It was felt that certification under a recognized authority was essential to rounding-off the scheme; and negotiations with this object in view were entered into with the City and Guilds of London Institute, on the basis of certification by attendance at classes and proof of practical competence, instead of by written examination. But the authorities were not disposed to depart from their practice, and insisted on a simple written examination. At the Institution meeting, there was a little tendency towards non-acceptance; but, in the end, there was agreement. On the whole, the last reports of the Examiners in "Gas Engineering" and in "Gas Supply" (Mr. Thomas Glover and Mr. Walter Hole, respectively) were exceedingly satisfactory. There was a considerable increase in the number of candidates. Of 278 who entered in "Gas Engineering," 193 passed, and Mr. Glover reported that the quality of the work done was well above the average of past years. In the Honours Grade, the students appeared to be deficient in engineering training, but they indicated that in chemistry they had been well taught. In the "Gas Supply" section, there was the remarkable increase in the number of candidates from 407 to 538; and of these 432 passed. Mr. Hole was pleased with the general preparation of the candidates, though he hoped for improvement in mathematics.

Gas Legislation—Calorific Power.

There was no real masterpiece in Parliament last session from the gas industry; and, generally speaking, it was a sleepy sort of session. The measure of greatest interest to receive the sanction of Parliament was that of the Tottenham Company, who are taking over the Enfield concern, and are commencing operations as electricity suppliers in Wood Green, with power to enter into negotiations for the purchase of other electricity supply undertakings and rights. The Company will now be known as the Tottenham Light, Heat, and Power Company. The Bournemouth Company have acquired the Christchurch Company's property; and the Grays and Tilbury Company quite a number of small undertakings. Electricity supply powers were also secured by the Herne Bay and the Westgate and Birchington Companies. The West Bromwich Corporation obtained a 13-candle gas standard, and the Redcar Company a 12-candle power one, united with a calorific power clause in a form not generally approved. The Morley Corporation and the Porthcawl Company have succeeded in getting their standard altered from illuminating power to calorific value, on the South Suburban model. The notices of Bills for next session contain quite a shoal of applications for transference from illuminating power standards to calorific value ones; and the session will no doubt be the beginning of a serious movement in connection with the general change-over. Purchases of gas undertakings and electricity supply authorization are also much to the front. We see here and there permission being asked by municipal authorities for power to affix brackets and other fittings to private buildings for the purpose of central suspension lighting. Promoters of gas Bills are earnestly warned against accepting the new model clause referring to manufacture and trading in residuals, inasmuch as, in our opinion, it certainly does not confer the right to "deal in" residuals in accordance with the decision of the Joint Committee, and the preservation of this right is very essential as an industrial safeguard. The Gas Companies' Protection Association continued their good work in watching in Parliament over the interests of gas companies' undertakings. But their intervention was not needed in the same prominent manner as in the preceding session, when the chemical manufacturers were arrayed against the gas industry in seeking to unduly restrict their operations.

In Australia there was much controversy regarding a measure introduced for the legislative regulation of gas companies. The original proposals were distinctly unfair; but the representations of the companies concerned succeeded in effecting changes, and, in the final form, the Act follows very much upon the lines of general gas legislation at home.

Reverting to calorific power, the subject has been a front place one during the year. It has been on the *tapis* at the Irish Association meeting and before the London and Southern Juniors—the lecturer on both occasions having been Mr. Jacques Abady. From America, we have had a number of reports on the question; and the change-over to calorific value is being forced ahead there at good pace. As in this country, "gross" values and "B.Th.U." are being adopted as terms, and both in America and by Mr. Abady there is recommendation that a method of measuring total heat should be adopted, as readings from the ordinary calorimeters are somewhat low. In the Bills of the Gaslight and Coke Company and the Liverpool Company as lodged for next session, they ask that "total heat value" shall be measured. It is also urged that numerical terms of standard clauses should not be pitched too high, in view of what has been learned as to the possible realization of the maximum B.Th.U. per ton of coal carbonized.

Legal.

The cases in which gas has been concerned in the Law Courts during the year are not of a very imposing character. There were several; but, except in two or three instances, it would be waste of time to remind of their lines. They were most of them so very ordinary, with little about them that has any general principle attaching. There were, for instance, a few cases of workmen's compensation—some went in favour of the gas companies; some against. Happily there was little in the way of embezzlement cases. There were disagreements (which the Courts have adjusted) between lamp makers. There was a continued clearing up of the *débris* of the unsound flotations of a few years since. Edmund Eaton and some of his associates were summoned for issuing circulars and other documents without the names of the printers attached. In certain of them, they also made use of some distinguished names in a manner that was not legitimate. They will exercise a little more care in their specious circulars in future. There was also a dispute in regard to the quality of gas coal supplied to the Turkish Government. But there was only a proof of inferiority on a small part of the supply; and the extent of this is shown by the awarding of the nominal damages of 40s. Two or three cases in which damages were given in respect of accidents are interesting. In one case the South Metropolitan Company had damages against them to the amount of £500 through a man, riding a motor bicycle, running, in a fog, into one of their motor lorries, which he alleged was on the wrong side of the road. In another instance, a workman of the Company left on certain premises a ladder over which a man stumbled, and was injured. The man received £10. The Gaslight and Coke Company were called on to pay £175 damages, owing to injuries sustained through a workman leaving a stone slab projecting from

under a gas-stove. Another man obtained £15 damages from the Commercial Gas Company in respect of injuries due to a fall over a chair that a prepayment meter collector had been using in order to reach the cash-box of a meter. A man who sustained injury by falling over an unlighted hand truck belonging to the Tottenham and Edmonton Gas Company was awarded £75 damages. These are all cases that should act as warnings to gas employees. Of interest, too, in view of modern developments, was an action in which the Tunbridge Wells Gas Company were concerned. A gas-heated water-boiler, which they had guaranteed, was lighted while the pipes were frozen. The case (in which damages were claimed) was taken to appeal by the Company; but they were unsuccessful. The "Wandle," the new ship of the Wandsworth, Wimbledon, and Epsom Gas Company, misbehaved herself in the Thames; and there was a question of damages to Wandsworth Bridge for the Company to settle. Collisions with lamp-posts by motor-cars brought one or two cases into Court on the question of the negligence of gas suppliers; but they were relieved of all part in responsibility.

The case of the year of perhaps most general interest to gas-works owners was that in which application was made for an injunction and damages against the Conway Corporation in respect of a nuisance alleged to be caused by the gas-works, and damage to trees in a private garden. The injunction was granted, but was suspended till June 30 next. It is understood that there is to be an appeal. During the year, a contrast to this case appeared in photographs published by us of the luxuriant horticultural growth round about the Aberystwith Gas-Works. Also of importance was the action brought by the Whittington Gas Company against the Chesterfield Gas and Water Board in respect of an extension of a pipe into their district. It seems that the Board are debarred from laying mains in certain parishes supplied by the Company, but may supply consumers by service-pipe. The point that had to be decided was whether what had been done was a main extension, or merely the laying of a service-pipe. Mr. Justice Eve determined that it was the latter, and so legitimate. A case was also heard in which it was sought to restrain the Limerick Corporation from levying a rate for the assistance of the electricity undertaking; the prices charged for electricity not having reached the maximum allowed. It was decided that the Corporation had no right to levy the rate under the circumstances; and since then they have raised the price charged for electric energy.

A curious valuation case was heard, in which the Airdrie Gas-Works were involved. There are two rating authorities—the Town Council and Parish Council of New Monkland. The Town Council, however, are the authority to hear appeals from the assessors' valuation; and the Parish Council contend that the Council, being judges in their own case, have always been inclined to underrate their gas undertaking. The Town Council, in this instance, fixed the rental for the year at £5500; and they have promised that next year they will call in the Assessor of Railways and Canals to give a valuation of the works. The Parish Council have asked the Town Council as the authority hearing appeals to state a case. As a result of the arbitration in the matter of the purchase of the Sidmouth Gas and Electricity Company's property, £34,683 was awarded; and it was expected that compensation, expenses, &c., would bring up the amount to about £40,000. In the Ashbourne Gas-Works purchase arbitration, Mr. Ernest Moon, K.C., awarded £39,667. In fixing this sum, he had regard to the obligation of the Council to make a further payment to the Company in terms of the Act of 1912.

In the World of Labour.

In the industrial world, the year has seen a state of continual ferment—the part of the world that has been most peaceful has been where co-partnership rules. A perturbing matter has been the number of local strikes in which agreements have been violated, and strikes commenced—even without the countenance of the trade unions, and in some cases against the advice of the leaders. In most trades there have been outbreaks, of small or large dimensions. But the more serious ones have been in connection with the paltry excuses made for creating sporadic trouble in the coalfields and on the railways. Labour appears to delight nowadays in demonstrating its power to produce public inconvenience by striking when even discipline or safety has demanded the discharge of a man or a lowering of his status in the employ. There have been two or three such instances in connection with the railways. The unions, however, do not appear at all anxious to encourage a general strike at the present time, which is the weapon the extremists are striving to bring into use when, in any one section of industry, they want to exert pressure upon the employers. Even the postal workers who have been trying to force out of the Government fresh concessions (and whose action at one time menaced the postal arrangements at Christmas time) have considered whether compliance with their demands cannot be compelled by entering into compacts with the railway, miners', and transport workers' unions. The proposal, when discussed, was only defeated by two votes. But the reason the union leaders see that there should not be a general strike at the present time is found in the financial strain that year by year is placed upon organized labour's funds. It is gathered from a report of the General Federation of Trade Unions that, for the third year in succession (to March last), the expenditure has exceeded the income. In the last of the three years, the total income was £220,133; and the amount returned to the districts affiliated was £365,319. This condition of things is attributed to various causes—among them "intellectual and economic unrest," increased tendency to general strikes and lock-outs, and movements on the part of workers to get strike pay as against lower out-of-work pay.

There has been the customary discussion of stock labour topics during the year, in the way of labour legislation, the eight-hour day for all workers, and such-like matters. The increased cost of living has been made one of the points in agitations for improved conditions. An inquiry by the Board of Trade resulted in the information that in recent years food and fuel costs have risen by 13 per cent.; but, inasmuch as the rents of property have diminished, the net rise has been about 10·3 per cent. Yet another matter of interest to labour and to every industry has been the decisions of the Umpire referring to unemployment insurance. Lengthy lists of the decisions so far as they affect gas workers have appeared in the "Journal." In connection with the National Insurance Act, the Employers' Parliamentary Association has concluded that the closer the acquaintance with its provisions, the greater the emphasis on the need for amendments.

From general agitation, the gas industry has not been immune. At quite a number of places there have been, with varied result, applications for improved conditions of pay and hours of work. There have also been strikes. A partial one was at Liverpool Gas-Works. The immediate cause was the reduction in position of a retort-house hand for a breach of the regulations; and the Gas-Workers' and General Labourers' Union (who have been very busy lately when the thin end of a troublous wedge has happened to be in), made claims for higher rates of pay and other concessions. The Company steadily and resolutely refused to recognize the Union. However, all's well that ends well. Peace was restored. There was also a strike at Stockport; and in this was seen the tyranny of trade-union labour over non-union labour. Workers in the meter-repairing shops of the Nottingham Corporation Gas Department had a long period of leisure—some thirty-two weeks—which ended in a satisfactory settlement without any sacrifice of principle on the part of the Gas Committee.

The year is ending up badly—more especially in the North Country. There is another movement among Corporation employees of a kind that does not contribute to the happiness of the communities attacked. When the workers of a local authority, especially if the body controls trading departments, conspire to strike simultaneously, the position gets exceedingly awkward. The Blackburn gas-workers handed in their notices; but effect has not been given to them pending a comparative investigation by an expert—the expert appointed being Mr. John Bond, of Southport. Leeds municipal employees, including gas, electricity, water, tramway, and scavenging men, struck work just recently; but their attempt to gain advantage by paralyzing the city's services has so far been defeated by good citizenship. The position of the strikers as we are writing is an ignominious one, but is exactly what is deserved. The Manchester Corporation also find themselves confronted by a comprehensive programme referring to employees' rates of pay and other conditions presented by the National Union of Gas Workers and General Labourers. The threat is Manchester, then Liverpool; but after the experience at Leeds, we have to

wait and see just what will happen. Australian gas undertakings have had their labour troubles. In February there was a breaking of contracts and a strike on the part of the gas workers of Sydney; and some 2000 men were involved. The strike ended early in March; concessions in wages being made. Summonses were issued against a number of the men; and some 100 of the principal offenders were fined for disobedience to the law—the aggregate of the fines being about £900. There was an agitation among Melbourne gas workers; and there the Arbitration Court, considering the increased cost of living and other matters, increased the wages of the yardmen by 6d. per day, and of the stokers by 3d. per shift—thus showing that the wages had already been levelled-up near to what was judicially considered the correct amount.

Co-partnership continues to thrive in the gas industry. With the exception of the partial strike at Liverpool (where the system is young), there has been no trouble where its influences are rooted, and have created a new interest in the men. Among the new adherents are the Swansea and Canterbury Gas Companies. The gospel of co-partnership has been preached on every conceivable occasion where usefulness could be served. There was a paper on the subject at a meeting of the Society of Arts. At the British Association meeting, Mr. Charles Carpenter, D.Sc., discussed the question as to whether co-partnership and trades unionism are incompatible; and he made out an excellent case negativing any such idea. In separate papers, at the Co-Partnership Association meeting in Leeds, Mr. Carpenter again dealt with the question from the point of view of industrial efficiency, and Sir Corbet Woodall, D.Sc., from that of the public good. Those who sought to criticize found stalwart champions in the two. The ever-present troubles in the labour world have again brought co-partnership to the front in Parliament; and Mr. James F. Hope introduced a Bill, with the object of facilitating the application of the principles to industry generally.

Official Changes.

The list of official changes that we have before us this year is an unusually long one; and those who have had part in them (they have made a remarkable alteration in the location of the professional *personnel* of the industry) will not expect us to re-chronicle them all here. Everyone in his new sphere has our best wishes for happiness and prosperity. There are a few changes, however, with special circumstances attaching to them, which should be mentioned. Mr. James W. Helps, consequent on continued ill-health, resigned the appointment of Chief Engineer and General Manager at Croydon; and Mr. Archibald Caddick was, in consequence appointed Engineer and Works Manager, and Mr. W. J. Sandeman has taken rank as Distributing Engineer and Sales Manager. The retirement is announced (to take place next March) of Mr. J. T. Jolliffe, of Ipswich; and he is to be elevated to the Board. Mr. Frank Prentice becomes Chief Engineer and Manager. Mr. G. Thornton Andrews has retired from the chiefdom at Swansea, and he also goes on to the Board; while Mr. Reginald G. Clarry takes up the official duties. Mr. John Chew, who has been Manager at Blackpool since 1862, has relinquished office; and to it Mr. William Chew succeeds. Other retirements have been: Mr. Charles Armitage, of Lancaster, Mr. S. Carpenter, of Dorking, Mr. A. Dougall, of Kidderminster, Mr. F. C. Humphrys, of Ilkeston, Mr. S. S. Mellor, of Northwich, Mr. H. S. Pike, of Colchester, Mr. Edwin Roe, of Nottingham (with 51 years' record), and Mr. David Stevens, of Pittenweem. From the chief engineership of the Melbourne Gas Company, Mr. Philip C. Holmes Hunt retires early in the year, to take up in Australia consulting practice and gas administrative work. Mr. J. N. Reeson goes to Melbourne to succeed Mr. Hunt; and Mr. T. S. Lacey enters into possession of the official position at Beckton. Mr. G. M. Gill has been appointed Assistant to the Chief Engineer of the Commercial Gas Company (Mr. Stanley H. Jones). By a natural order of things, after his intimate work for the Company, Mr. C. F. Botley has been raised to the chief engineership of the Hastings and St. Leonard's Gas Company, on the death of his father. Among others who have helped to change the face of professional representation have been: Mr. C. R. Armitage (Lancaster), Mr. W. J. Rendell Baker (Mansfield), Mr. F. V. Barnes (Todmorden), Mr. C. V. Bennett (Rochester), Mr. H. E. Bloor (York), Mr. J. W. Brown (Barbados, W.I.), Mr. Horace Chamberlain (Workington), Mr. C. A. Cunnold (Nine Elms), Mr. James Dickson (Johnstone, N.B.), Mr. J. H. Donaldson (Sevenoaks), Mr. Percy Dougall (Kidderminster), Mr. J. E. Holt (Ilkeston), Mr. E. G. Hutchinson (Carlisle), Mr. W. H. Johns (Malvern), Mr. W. J. Jolliffe (Harwich), Mr. Guy Lemmo (Horsham), Mr. J. H. Methven (Kensal Green), Mr. D. S. Munn (Renfrew), Mr. E. Owen (Wrexham), Mr. J. Paterson (Waterford), Mr. T. N. Ritson (Chichester), Mr. J. G. Tooms (Buenos Ayres), Mr. C. V. Townsend (Hereford), Mr. W. W. Townsend (Colchester), and Mr. J. Urquhart (Dorking).

Some interesting changes have been made in administrative circles. Mr. J. Horsley Palmer has, through ill-health, relinquished the chairmanship of the Imperial Continental Gas Association, and has been succeeded by Sir Charles Jessel. Mr. Henry Woodall has been appointed to a seat on the Board of the Gaslight and Coke Company; Sir Guy D. A. Fleetwood has been elected a Director of the Imperial Continental Gas Association; Mr. Henry Townsend is now Managing-Director of the Wakefield Gas Company; Mr. Thomas Berridge has become a member of the Board of the Leamington Gas Company; and Mr. William Mann passed from the secretaryship to the Board of the Brentford Gas Company. Dr. Frank Clowes has retired from the chieftainship of the chemical department of the London County Council; and Mr. J. H. Coste, who has been his chief assistant, has in consequence had his status raised. Mr. H. P. Maybury has been appointed Chief Engineer to the Roads Board.

Departed.

In the course of the year, many a home has been darkened that has association with the industry, and many a link of living friendship has been snapped among us, but memory remains. We have seen many of those who have now gone hence pass from the lower positions in the profession and industry to the higher; and they have worthily filled their places, subscribed to the world's work, and done their part in furthering its affairs. Their activities have ceased; they are no more. Others have replaced them; and so the chain of human work and progress continues unbroken. It is a long black list that is before us. Names that stand out from among those who died while still in office, or who have held professional position, are: Mr. George Anderson, Mr. C. E. Botley, Mr. Joseph Braithwaite, Mr. J. R. L. Cridland, Mr. W. J. Dougall, Mr. John W. Field, Mr. W. J. Fuller, Mr. C. W. Grimwood, Mr. Arthur Graham, Mr. Thomas Greaves, Mr. John Hornby, Mr. W. W. Hutchinson, Mr. A. W. Onslow, Mr. T. E. Pye, Mr. J. W. Randall, Mr. E. T. D. Sapey, Mr. S. Simmelkjör, Mr. Walter Tew, Mr. R. H. Townsley, Mr. Joseph Tysoe, Mr. J. M. Veevers, Herr A. Weiss, and Mr. T. B. Younger. From another sphere of manufacture in the industry there have passed: Sir William Arrol, Mr. Joseph Bennet, Mr. Thomas Coates, Mr. Robert Dempster, sen., Mr. J. Armitage Drake, Mr. S. Falk, Mr. Trotman Foster, Mr. John Goodson, Mr. Daniel Macfie, Mr. W. C. Parkinson, Dr. F. W. C. Schniewind, Mr. F. C. Sugden, and Mr. George Waller, sen. Quite a number of Directors have passed away; among well-known names being Mr. Ulick J. Burke, Mr. James Cloudesley, and Mr. Leonard R. Wilkinson. The year has also witnessed the removal of Professor T. S. C. Lowe and Dr. Rudolf Diesel.

Accidents, Etc.

The year has not been free from a number of fatal accidents. It would be a happy state of things if an industry of such extent, and with such an immensity of operation, could show a clean slate in this connection. We need not go in detail over the fatal occurrences at gas-works, but during the year there were rather more than a dozen; and some due entirely to that eternal trouble of familiarity breeding contempt. Others were pure accidents—events that human foresight could not have anticipated. There are two warnings arising from the accidents of the year. One is that great care should be observed in examining tackle, staging, and so forth upon which men work at a height; and the other is that every precaution should be taken before men descend into gasholder tanks under repair to ascertain that the gaseous conditions are absolutely safe. There were a few explosions—one at Banbridge Gas-Works had fatal results for the Manager (Mr. G. A. Mearns). The number of explosions and accidents with Diesel engines has led Mr. G. A. Taylor, one of the Inspectors of Factories, to suggest that competent engineers or experienced men should have

direct supervision over all Diesel plants, and that qualified engineers only should be employed as engine attendants. The numerous explosions there have been through the generation of gas from the bitumen and other coverings of electric cables—the disastrous ones at Nottingham and Hebburn being examples—have resulted in the appointment of a Committee by the Board of Trade to look into the question. The Aisgill railway disaster again raised the question of the use of gas on trains. Major Pringle was of opinion that gas, while it might have fired in its rush from the fractured cylinders, did not contribute to the destructive fire. At the same time, he thought that electric lighting should be adopted for passenger trains. The recommendation does not appear to receive the support of either facts or intelligent consideration of what is likely to happen to high-pressure gas under the conditions of a railway accident. There were gas suffocations and suicides during the year; but the number has not been nearly so great as in previous years. A tragic occurrence had its scene at Peckham, when three children were suffocated through the use of a gas-geyser without a flue in a confined bath-room. Needless to say the flueless geyser was fixed by a private person, and not by the South Metropolitan Gas Company.

In Conclusion.

This, in light survey, is the story of the year. We see from it that prospects are good in the matter of business. The popularity of gas in domestic and industrial life continues to grow; and the technical operations and parliamentary work of the gas industry are set in the direction of producing still greater economy by the supply of a gas suitable for all current needs, and thus contributing better than ever to the service of the public. The appliances by which the gas is used are highly efficient; there is, however, about some of them room for achieving even better results. The clouds that hang over the industry at the moment are found in coal, oil, and coke. A lighter cloud is sulphate of ammonia; but it will probably quickly disperse. It is sincerely hoped that the coming year will witness easier markets for raw materials, and an improved demand for coke and sulphate of ammonia. But whatever happens in these respects, it is open to us to heartily wish all our readers

Happiness and the Greatest Prosperity during

1914.

The Liverpool Gas Company's Bill.

The "Liverpool Courier" appears to be one of those papers that think there can be no good come out of new proposals of a gas company, save good to themselves. The paper in question has, in a general sort of way, been glancing at the provisions of the Liverpool Gas Company's Bill, and, by looking through a microscope the correct way, it sees a remarkable strengthening of the Gas Company's position, and, inverting the microscope, and examining the proposals again, it finds in them little good for the ratepayers. As a result of this singular mode of investigation, the paper in question is obviously inclined to agitate the question of whether the Corporation had not better buy up the Company before they make themselves still more secure in their fastness, and further increase the value of their property. Now if there is one thing of which Liverpool ought to be proud it is the excellent consideration the Gas Company have always given to the ratepayers; and it is in pursuit of this policy that the Company are now proposing modernization quite in accord with the interests of the consumers and of the future use of gas. There is nothing really important in the Bill for which there is not parliamentary precedent—in other words, that Parliament has not already sanctioned; and this point is worth considering before attempting to make any hub-bub over the Bill. The extension of the area of the Company's supply is quite in accord with progress. The Liverpool electricity undertaking has made a big inroad upon the lighting field that was once a preserve (excepting for oil) of the Gas Company. Therefore it is right there should be territorial extension. It is also a defence to the consumers within the city that those to whom gas is distributed long distances should pay something more for the service. The conversion of stock does nothing detrimental to the interests of consumers or ratepayers, excepting that it gives a large number of them better opportunities of from time to time becoming holders of stock in the Company.

The Calorific Power Question.

Regarding the proposal as to calorific power, the bulk of the gas consumed in Liverpool is now used for purposes other than illumination; and therefore the thermal value is of primary importance. But the "Courier" is solicitous for the consumers; believing that the proposed standard calorific power of the gas, being lower than the calorific power of the gas to-day, should carry with it a considerable compensation to the consumers. Now there are two ways of looking at this. Parliament very strictly defines what the Company may do in the matter of dealing with their revenue and profits, and the consumer is well safeguarded. It has been shown that, if the calorific value of gas is pitched too high, there is a limit to the number of B.Th.U. that can be obtained from a ton of coal—the thermal value obtained from a ton of coal in the shape of gas is lower than would be the case if the standard is fixed at a reasonable amount. This is an economic disadvantage to both consumer and Company. Then, of course, it cannot be expected that the "Courier" is qualified to look at this question from the technical point of view. If a gas is rich in illuminating power, its calorific power will also be high; but it is clear that the gas, being rich in hydrocarbons, will require a large amount of aëration, and very intimate aëration, to get the best heating effect out of it when used in bunsen burners, furnaces, or in the cylinders of gas-engines. This large and intimate aëration cannot be obtained under ordinary circumstances with gas of such quality; and the result is that the efficiency of the appliances is not so good as would actually be the case with a gas of appreciably lower calorific power. The Gas Company would not make the proposal they are doing if there was not excellent technical and economic ground for it; and it is a pity that there should be any attempt to set the ratepayers antagonistically against the Company on an imperfect appreciation of the position.

Gas on a New Fire-Proof Train.

The stupid newspaper assertions regarding the part that gas had in the Aisgill railway disaster, which assertions were disproved by (apart from scientific consideration) the report of Major Pringle, still seem to be looked upon as gospel by those with evident incapacity for realizing the true position and technical facts. Even assuming that gas dispersed at high-pressure has had part in railway carriage conflagrations, there are ways and means of preventing it subscribing to the tragic side of such accidents, without depriving the travelling public and the railway companies of its benefits and economies. The Lancashire and Yorkshire Railway Company last week started running a fireproof train between Manchester and Southport; and it will be a source of grievance to our electrical friends that this newest of trains—the latest in railway carriage constructional work—is illuminated by gas. All the outside panels of the carriages are of steel; the carriage floors, in addition to being double and insulated, are covered on the underside with fire-proof material; and the underframes and bogies are entirely of steel. The gas cylinders, carried on the under-frames, are separated from the floor by coverings of steel plates, and are also protected at the ends by steel plates to prevent possibility of damage. Each cylinder is fitted with an automatic valve; so that, if the gas-pipes are broken, the valve closes, and instantly prevents escape of gas. What objections have the electrical people to gas combined with this form of construction? With other forms, we have not seen them advance much objection that has not been shockingly weak and thin.

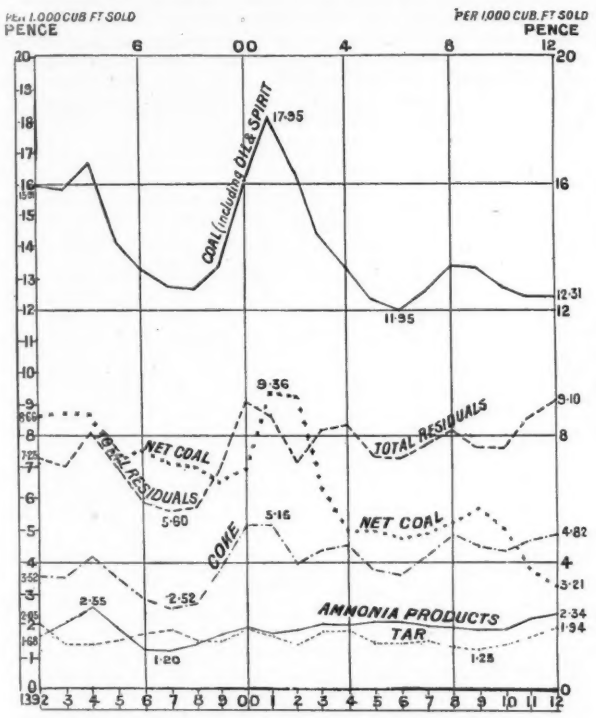
Benzol in Germany.

In connection with the liquid fuel campaign, it is interesting to learn that there are now upwards of seventy German makers of benzol represented in the German Benzol Association. An important thing from the motorist's point of view is that these firms all produce benzol of uniform quality. Distribution of the benzol is performed by some 1100 sale depôts scattered through Germany. The price at which the benzol is sold is fixed, and averages 40 per cent. lower than the price of petrol. This being

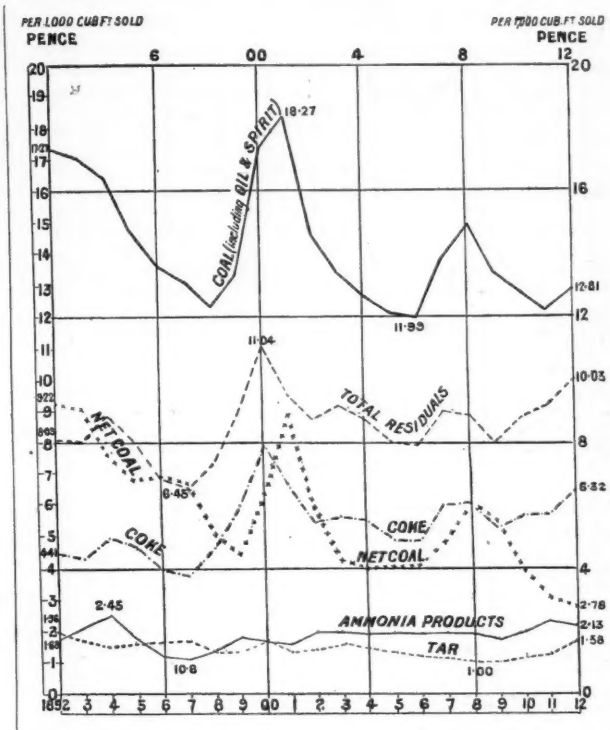
so, the latter cannot, having in view the good experiences with benzol for motor use, surely maintain its present price much longer. It is stated that the associated firms referred to have this year produced 140 million kilogrammes of benzol; the entire quantity being obtained from German coal. The coke-ovens are responsible for the greater part; and there are signs of further quantitative progress in the production of coke, which will in turn supplement the supply of benzol.

COAL AND RESIDUALS FLUCTUATIONS DURING THE TWENTY YEARS ENDING 1912.

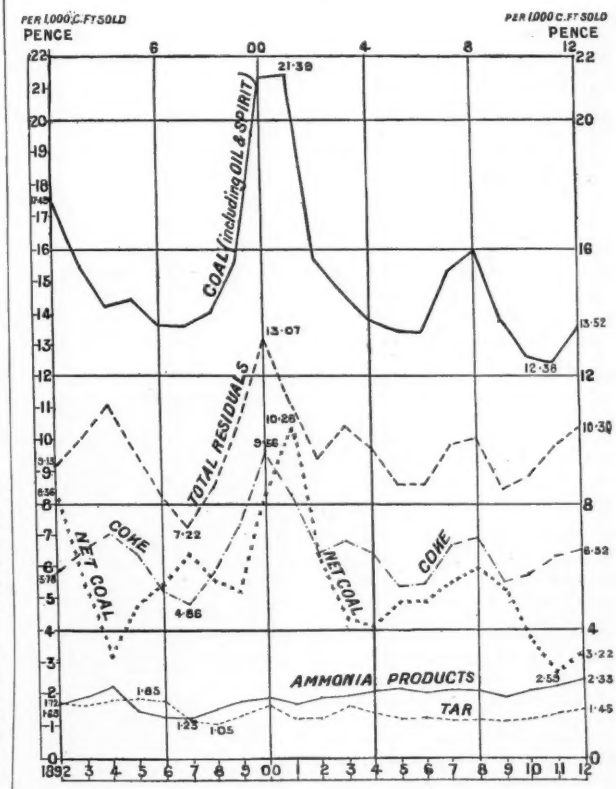
INTERESTING information is afforded by the accompapying three graphs, which have been forwarded by Mr. F. A. Price, the Superintendent of the Manchester Corporation Gas Department. They have been prepared by Mr. H. J. Brocklebank, the Statistician of the Department, from "Field's Analysis;" and they show, for the twenty years ending 1912, the cost of coal, &c., and the revenue from residuals, for the principal corporations and provincial gas companies, also for the three London Companies.



Principal Corporations (as per "Field's Analysis"). Cost of Coal, &c., and Revenue from Residuals for Twenty Years ending 1912.



Principal Provincial Gas Companies (as per "Field's Analysis"). Cost of Coal, &c., and Revenue from Residuals for Twenty Years ending 1912.



The Gaslight and Coke, South Metropolitan, and Commercial Gas Companies (as per "Field's Analysis"). Cost of Coal, &c., and Revenue from Residuals for Twenty Years ending 1912.

PERSONAL.

The Morecambe Corporation have appointed Mr. HAROLD CLAPHAM, of Preston, as Engineer and Manager for their gas-works. Mr. Clapham was lately Assistant Manager at the Preston Gas-Works, and prior to that was Chief Assistant at the Huddersfield Corporation Gas-Works.

It was reported to the Birmingham Corporation Gas Committee at a meeting last week that Mr. W. MASSEY, the Accountant to the department, had resigned to take up a London appointment. He entered the service of the Birmingham Gas Department in 1900, and has been Accountant for the last six years.

Mr. R. S. P. PRINCE, who for a number of years has been a member of the staff of Mr. R. W. Edwards, the General Manager of the Aldershot Gas, Water, and District Lighting Company, has been appointed Secretary and Manager of the Flint Gas and Water Company, Limited, in succession to Mr. Frank Batt (who, as announced in the "JOURNAL" for the 16th inst., has resigned), and will take up his duties after the 10th prox. Before Mr. Batt, Mr. W. Griffith Jones was Manager of the works.

Mr. THOMAS BERRIDGE, J.P., has been elected a Director of the Leamington Priors Gas Company, in place of the late Mr. Andrew Mooney, J.P., who died on the 3rd inst.; and Mr. W. E. T. HEMS has been appointed Secretary and Accountant to the Company, in whose service he has been for many years past. Mr. Berridge took up the position of Engineer and Secretary in 1897, after having been for eight years Manager of the Litchurch works of the Derby Gas Company. In addition to being a member of the Leamington Town Council, he has taken keen interest in educational and other affairs. He will continue to act as Engineer and Adviser to the Gas Company.

ELECTRICITY SUPPLY MEMORANDA.

It has on various occasions been our duty to deal with misrepresentation of gas affairs in the "Electrical Times;" and it is not therefore surprising to find that paper going to what in our opinion, and we hope in the opinion of many electrical engineers, is a mean length in its antagonism to gas. We do not think the interests of the electrical industry can be in any way served by the latest effort of the paper in question. In its issue for Dec. 18, it made some suggestions as to draft copy for the advertisements of electricity undertakings. Among the "copy" are two extracts from the recent article by the "Lancet" on "The Bane of Sulphur in Gas Supply;" an eleven-line paragraph which the "Electrical Times" attributes to us, but of which lines only four-and-a-quarter are ours; and an extract from one of the articles of "M. O. H." in the "Sanitary Record," which curious individual has found himself pinned up against the wall kicking out strangely in all directions in the attempt to cover as much as possible the foolish position in which he was instrumental in placing himself. When the "Lancet" article was published, "Meteor" adopted it with fervent delight. But there was silence afterwards. In the "JOURNAL" for Nov. 18, we dealt with the chemical aspects of the "Lancet" article; and the "Electrical Times" knows this. It also knows that the writer in our medical contemporary has discreetly seen fit not to commit himself further on the chemical side, in face of our criticism of his views. What the "Lancet" has declined to do, our electrical contemporary has not done, although it now advises electrical engineers to adopt extracts from the article which we were able to discredit. However, now the latter paper has adopted for circulation the statements of our medical contemporary, we have a right to ask it to advance its chemical defence of the statements, in view of the destructive criticism that appeared in our columns on Nov. 18. If it cannot do so, then it will be gross dishonesty for anyone to accept the suggestion that the excerpts from the medical paper in question should be utilized in the manner proposed in the interests of electrical undertakings, and to the disparagement of gas supply. We have yet to learn that there are many electrical men who are prepared, little as they love the gas industry, to play the low-down game of hitting below the belt. Supposing an electrical engineer does attempt to disparage the local gas supply by taking upon himself the responsibility of publishing, in the form of advertisements for which his undertaking will pay, the extracts from the "Lancet," and he is challenged on the chemical aspects of the matter, is he to take the cowardly course of sneaking-off under the cover of the "Lancet?" We shall be sorry if any gas undertaking allows an electrician to take any such course. Before this matter goes farther, we think the "Electrical Times" owes something to its readers in connection with it; and we will give it an opportunity of discharging the obligation. It will afford us pleasure to discuss the matter from the chemical standpoint with "Meteor" or any other member of the staff of the paper, provided there is technical discussion, and not a mere indulgence, by our contemporary, in windy talk. In the event of our contemporary declining to accept this invitation, those electrical engineers who are in the habit of reading the "Memoranda" will know what judgment to pass on the refusal.

The Art of Hitting Below.

If there was any want of advertisement copy on the part of gas undertakings, they could find a good measure in the shortcomings of electricity; and they could advance these with greater certainty of being able to prove that they have occurred than the electrical engineer is of being able to support the "Lancet" in its queer story regarding sulphur in gas supply. On this point, Lord Rayleigh's Committee knocked all the stuffing out of those who used to try to propagate the most astonishing absurdities on the subject. But there has been no Committee appointed by a Government Department who have stated that electricity is the most dependable light in existence. The failures of supply during this year form a tremendous list. With advancing age, reliability is not a growing characteristic of electricity supply. It seems to grow worse instead of better in this respect. We are sorry for it. It is very noticeable, too, that its misconduct becomes accentuated as the evenings get shorter; and this year is not an exception to the rule of previous years. In the last two or three numbers of the "JOURNAL," the notices of collapses of supply have been substantial ones. Private residents, shopkeepers, churchwardens, those responsible for the lighting of streets, and the public generally have been inconvenienced and annoyed. In various places the failures have taken place during the Christmas shopping season, when the tradesmen look for the best harvest of the year. Take Eastbourne as an example. There the electricity supply failed on both the Saturday and the Monday preceding Christmas Day; and the fuming and worry of the shopkeepers who were not in possession of a gas supply knew no bounds. What fine advertisements such occurrences would make for permanent use by the local gas undertakings! There is something more substantial about this sort of thing than the easily destroyed article on sulphur by the "Lancet," the criticism of which there has been failure to answer. The collapses of electricity supply have a splendid influence in having gas re-established for constant use or for protection.

Failures.

Some of the electrical papers have been hurrahing loudly over the maintenance of the electricity supply during the strike at Leeds, while the gas consumers for a time were put on short commons. In their exultation, the shouting papers appeared to forget that electricity supply frequently fails when there are not strikes, and, as mentioned in the previous paragraph, there has been of late a plentiful crop of such (for the users) uncomfortable incidents. But the ease with which the supply of electricity can be kept going providing all is well with the generating plant, the distributing system, and the hundred-and-one seats of feebleness, illustrates precisely the ease with which the current can be cut off. Paris and other places have illustrated this when discontent among electrical employees has ruled. Gas-works plant is becoming less dependent on practised labour, owing to mechanical operation; and Leeds has proved how quickly men with intelligence can get their hands in, and carry on a gas plant. Without mentioning a name, it may be remarked that one of the young engineering stalwarts who volunteered to assist in keeping the public services going at Leeds, and, as fate would have it, had allocated to him a post at the electricity-generating station, has a paternal eye kept upon him from the "JOURNAL" office. No matter, however, the nature of the work, duty and citizenship first. But how great ought to be the gratitude towards us of our electrical journalistic friends!

Strikes and Supply.

Being Christmas season, and gas men being as fond of a hearty laugh as anyone, we may refer to a strange concoction of words and ideas that "Meteor" has lately served up to the readers of the "Electrical Times." He is writing on what he calls "The Dilemma of the Gas-Stove Designer." The "dilemma" has for the gas-fire makers an excellent showing in the way of output and £ *s. d.*; the only dilemma, in fact, from which we know the manufacturers of the most popular types of gas-fires are suffering is that of how to temporize with customers owing to the rush of orders and the impossibility of immediately executing them all. "Meteor" starts with the remark: "The beauty of a common naked gas-jet for heating purposes, is that 100 per cent. of the B.Th.U. are passed into the room. Incidentally, some horrible poisons are produced also, so that no factory inspector would allow such an arrangement to persist." Our friend has no more knowledge as to what the "horrible poisons" are than the man in the moon. To him, however, that does not matter a jot. Such extravagant and senseless expressions please him vastly, and no doubt some of his readers as well. The point about the factory inspectors is an evidence of mental incapacity to appreciate facts. There are, despite factory inspectors, so many flat-flame burners still existing in factories that we are ashamed of the lethargy that exists on the part of some gas suppliers over the persuasion of factory owners to do better with the gas they use. It is in the case of the domestic gas-fire that our friend thinks that the designers are on the horns of a dilemma. "Either he must impart poisonous fumes to the living-room, or he must send heat units hustling up the chimney at a pace sufficiently healthy to avoid this crime." As a matter of fact, as the gas-fire is fitted, he does neither. "One authority," says this singular critic, "finds that even if the canopy is lowered almost to the level of the top of the fuel so that paterfamilias cannot warm his coat tails, it is by no means certain that all the evil fumes will pass through the flue-outlet." Nothing more is wanted than this to show that "Meteor" does not understand in the least the points in the controversy that has been going on in our columns. The "Electrical Review" recently placed at the top of one of its leading articles an aphorism in which we have reason to know it strongly believes. It is this: "Where ignorance is profitable, 'tis folly to be wise." "Meteor" is also a devout believer in the truth of the amended maxim. In the course of the rigmarole from his pen, there is only one sensible sentence, and it is the last: "We thought that gas heating was so ridiculously cheap as compared with electricity." And "Meteor" did not think wrongly. But there is a dilemma out of which our friend has not yet escaped. When is he going to produce data obtained by scientific tests (the lines of which he will describe) to prove that the scientists who have dealt with the question fo gas-fire efficiency are a set of fools, and not worthy of credence? He hesitates long over this, but fills up his time occasionally with a little gibberish about the reputed efficiency of gas-fires causing amusement, because steam-boilers seldom reach an efficiency of 80 per cent. Where the connection comes in is best known to our imaginative electrical friend. But let him get to the real business, and in a proper, manly sort of way.

For Christmas Reading.

The "Electrician" has been writing on the subject of tariffs; and as far as we understand the argument of our esteemed contemporary, it would like those stick-in-the-muds who charge (say) only one-fourth or one-fifth of the lighting rate, or 1d. per unit, for electricity for heating and cooking to come down a bit lower to a tempting level, which we take it, in our contemporary's view, is about ½d. per unit. The view shows up the weak position of electricity in the competi-

Price of a "Fad for the Cranky."

tion for the cooking business, quite apart from the cost and maintenance of apparatus, and other uncomfortable things that are inherent to electric culinary operations. The "Engineering Correspondent" of the "Yorkshire Post," in an article in that paper, appears to agree with this aspect of the matter. He says: "It is fairly certain that, with a tariff higher than 1d. per unit, electric heating and cooking can only be a fad for the cranky or a luxury for the rich. At 1d. per unit it is being used in one or two places by restaurateurs, who after lengthy trial profess themselves well satisfied with its economy, and it has also found its way into a good many homes. But even at this low price, there is not likely to be any very considerable extension of demand." So it means the division of the 1d.; and with that there is a growing electrical concurrence. The "Electrician," however, falls into a strange argument. It says: "If the tariffs are not adjusted in such a way that the public can take full advantage of the supply, then there is reasonable cause for complaint. It may be said the public does not voice any such complaint! That may be; but we should like to see it voicing a great deal of appreciation." Now we know of a few cases in which the lines advocated by our contemporary in the matter of the adjustment of tariffs have been adopted, with the result that there has been more than a reasonable cause for complaint on the part of the ratepayers generally. There was such a cause for complaint on the part of the Limerick ratepayers; and the Law Courts decided that a bit more on the price would be fairer and more lawful than putting a burden on the ratepayers generally in the creation of which they had not been parties. At Southampton, ½d. per unit applies to heating and cooking, and the Chairman of the Electricity Committee (so we understand from the "Electrical Times") has been advocating a rise in the price, as against the views of the Electrical Engineer. We remember that though the price is ½d. per unit at Southampton, the Committee not long ago found that something would have to be done to protect the undertaking against the return of radiators that had been fixed and let on hire. The "Electrical Times" has been setting the Chairman of the Southampton Electricity Committee in what that paper considers is his right place, owing to his temerity in going contrary to the professional engineer's advice. We have known clever professional engineers who are bad commercial men; and we have known clever commercial men who cannot lay claim to being professional electric engineers. We have known electrical editorial writers, who are frightfully bad chemists, and certainly not good gas engineers. So perhaps, after all, there is not anything much in the criticism of the Chairman of the Southampton Electricity Committee, because we are not altogether sure that his critic can boast of much commercial acumen.

Shocking the User.

There has been a certain amount of sympathy on our part with the manufacturers of electrical appliances in regard to the repeated attacks made upon them—largely because someone has to be made the scapegoat—for the deficiencies of electric kitchen appliances. Of course, we have not ventured to suggest that the makers are immaculate and free from all fault. They are not, at any rate, in respect of exposed terminals. One electrical writer has been making an investigation into this matter in connection with self-contained electric kitchen utensils. Quite a small amount of attention has been given to this matter. All sorts of things are supplied with protruding split pin terminals intended to be covered by loose connectors when being used. Apart from the risks of fuse-blowing and damaging apparatus, the danger of shock is great. In certain cases, it is pointed out, it would only be necessary for a child to be playing about with a hair-pin to set up a short-circuit, or the user might receive a shock from the careless handling of a knife, spoon, metal skewer, or other domestic implement. In the event of a short-circuit, a great deal of damage would be done. That is a bad condition of things; yet when the makers have their attention drawn to these things, they elevate their eyebrows in mild surprise, as though it had never occurred to them that such results could arise from an accidental misuse of their appliances. However, the manfacturers cannot point at each other. With few exceptions, we are told, they are all tarred with the same brush; and it is high time they were awakened to the danger of permitting any exposed conductors on portable appliances for domestic use.

The late Mr. Charles E. Botley, of Hastings, whose death was recorded in the "JOURNAL" for the 28th of October, left estate of the gross value of £17,068.

At the Students' meeting of the Institution of Civil Engineers on the 19th inst., Mr. W. E. Gurry read a paper entitled "Air Filtration and the Cooling and Ventilating of Electrical Machines." The author dealt with the general principles of, and the plant used for, air filtration and the cooling and ventilating of electrical generators; his paper being illustrated by a number of lantern slides. A discussion followed; and the author having replied, the Chairman, Mr. J. S. Highfield, M.Inst.C.E., in his remarks, expressed the hope that the author would enlarge upon one of the matters lightly touched upon in his paper—namely, the gasifying of coal and the recovery of the bye-products, the use of the gas as fuel for generating steam and of the bye-products for many and varied purposes.

WORKS TOPICS—XIII.

By "Modus Operandi."

THE paper by Messrs. Smith and Pearson, on the Birmingham Coal-Testing Works ["JOURNAL," Dec. 16, p. 876] contained much interesting information; and it is proposed to discuss this week a few of the points mentioned.

STANDARDIZATION OF GAS.

The authors state that "it is necessary to-day to supply gas of good heating value, constant specific gravity, and, in addition, to still maintain [*sic*] gas of standard illuminating value, although this latter may be lower than formerly." To obtain constant specific gravity, it follows that the gas must, of necessity, be of uniform composition and calorific power—otherwise the specific gravity will not be constant. This is a tall order; and though it is undoubtedly an ideal towards which we should strive, it is yet exceedingly difficult to attain success. Before this desideratum is fulfilled in general practice, many alterations will have to be made in works plant and methods.

Every district official who reads a paper considers it his duty to state that the gas must be of uniform quality and of constant calorific value, composition, and specific gravity. It is, of course, very desirable to emphasize the importance of these points in gas supply; but at the same time such perfection in practice is quite impossible. One might just as well state that no burner on the district must be allowed to contain one speck of dust.

There is, however, no doubt at all that this question of uniformity is increasing in importance year by year. It is, therefore, somewhat strange that this important matter of making gas day by day of uniform composition, calorific power, and specific gravity has never been, so far as the writer is aware, the subject of any paper or article in the Technical Press. The difficulty of attaining such an ideal is sufficient to deter any engineer from putting on paper any definite means of achieving success.

The South Metropolitan Gas Company have, as is well known, given a good deal of attention to the question. In this case the limiting of the manufacture to coal gas only and the multiplicity of works, which are, further, linked-up for the interchange of gas, constitute two factors of importance. Again, the bold policy which they have adopted of supplying standardized burners and fires without any provision for adjusting the air supply, indicates very forcibly the firm intention of the Company to standardize the gas as well as the gas appliances. There is no doubt that by this means the consumers will obtain the greatest possible satisfaction. It is an ideal; and it is one that is bound to bear a harvest of good fruit in the future.

ADVANTAGE OF CONTINUOUS VERTICALS.

The diagrams given to show the varying calorific power of the gas made by the horizontal and Dessau retorts emphasize very strongly the vast superiority in this respect of continuous verticals. It would appear that the use of this latter type of retort would go far to render easy the standardization of coal gas. The ease with which the coal-feed can be increased or decreased, and the resulting improvement or reduction in the quality of the gas made thereby, is a matter which is of great importance in this question of uniform gas.

Might the writer suggest that Messrs. Smith and Pearson should ascertain the least variation in calorific power, composition, and specific gravity that it is possible to maintain in the gas made in the horizontal settings of the Birmingham testing works? The test should be prolonged over a period of (say) a fortnight, while using several different kinds of coal. Such a test carried out by experienced chemists would be of inestimable value to scores of gas engineers who are fully alive to the importance of maintaining a uniform quality of gas, but who require data as to the best means of working their plant to attain this end.

COAL-LIMING.

The Birmingham authors' account of their investigation of Paterson's coal-liming process is valuable as giving independent and authoritative experience of the working of the process. Apparently it achieves what Mr. Paterson set out to do—to reduce the sulphur compounds in the gas to a reasonably low figure. It also, according to the authors' test, increases the yield of ammonia by 4 or 5 per cent., and reduces the percentage of SH_2 in the gas. In attempting to arrive at the financial result of using this process, the authors give figures to show that, after paying for lime and labour, there is little or no profit—based on the Birmingham test figures. On the other hand, one of the greatest advantages claimed for the process is that it cures stopped pipe troubles. But as the authors have no difficulty whatever on this score, it is not altogether surprising that no improvement in this respect was noticeable.

The amount—3·1 per cent.—by which the coke is increased in weight owing to the presence of the lime is credited to the process, as adding value to the coke by reason of the additional weight. This cannot be a correct standpoint from which to consider the question; for, if this were so, it would be sound practice to add a percentage of rubbish to the coal so as to obtain it as "coke." This increased weight should, the writer thinks, be disregarded in estimating the financial advantages. A higher content of ash in the coke cannot do otherwise than depreciate the value of the

fuel. The cost of labour in adding lime to the coal appears to be extraordinarily high. That it should cost 3·5d. per ton of coal to add to it 2 per cent. of lime seems quite unaccountable. The arrangements for doing this at Birmingham must surely have been very inefficient, and would not be reproduced on a works that adopted the process for regular use. If this be so (as would seem to be the case), the cost of liming the coal in practical work—as, for instance, at Cheltenham—should have been mentioned. Otherwise, a false idea is conveyed of the economical merits of the process.

Holder Storage Capacity.

To those engineers who are not satisfied with a holder storage capacity of under 24 hours' output, it will be a matter for surprise that a works of the size of Oldbury [*ante*, p. 892] has had no more than four to five hours of storage. This is now being rather more than doubled by the erection of a new spiral-guided holder of half-a-million cubic feet capacity, with provision for increasing it a further quarter-of-a-million cubic feet by adding another lift. Even with this addition many engineers would consider the storage was insufficient, unless, perhaps, there was an ample reserve in the shape of water-gas plant. In this connection, a factor of importance is the relative day and night consumption. Where, as in certain industrial towns, there is a fairly uniform output from 6 a.m. to 12 p.m., there is no doubt that the storage capacity can be reduced with safety to a figure very much below the usually accepted standard. In these cases, indeed, a twelve-hours' storage would probably be as effective as a twenty-four hours' storage in the case of a works supplying a residential town, where the consumption in the lighting hours may well be four times as heavy as during the day.

WOMAN AND THE GAS INDUSTRY.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

At first sight it may appear that questions relating to the position of women are out of place in the columns of the "Journal," and are objectionable as likely to bring in the question of "votes." With the political situation we are not concerned, but as much cannot be said about the social and public position. Observers of the habits and customs that go to make up the sum and substance of our daily lives, must have been impressed with the change in this respect during the last half-century or so. It was formerly supposed that a woman's home was sufficient to fill up the whole of her time and energy, and that it was no more fit for her to figure outside it than for a snail to leave its shell. If she had no husband or children to look after, she was to take a back seat or no seat at all, but to get out of the way and spend her time making antimacassars and nightcaps for the heathen. She was not expected to take any interest in politics, public affairs, or business. We hear a great deal about militants, hunger strikers, and incendiaries; but behind all this there has been a quiet, uneventful, but none the less powerful, social upheaval. Women to-day are taking a share in business and in public life, in questions of education, public health, morals, and general well-being; and this movement has set its mark on our industry in many ways. More than one eminent authority on matters of this sort is to-day interested in extending the use of gas, not because she has any direct or indirect concern in the business, but because she believes in it as an aid to advancement of the general public health, civilization, and refinement, capable of lightening the daily household drudgery of the thousands, if not millions, of women who either entirely or partially do "the work of the house." She appreciates the fact that with the aid of the gas-cooker, gas-fire, and hot-water circulator, a woman can prepare a substantial meal, hot water for a bath, and warm a room up to any reasonable temperature, without prolonged, tiresome, dirty labour, and without the soiling of her hands or clothes. The duties which formerly occupied the whole of the day, during which period (to use a common expression) the housewife was "not fit to be seen," can now be accomplished in half the time, leaving an easy margin for useful employment in other matters, or for healthful recreation. After a woman has carried a heavy coal-box and ash-box up and down a flight of stairs half-a-dozen times, she naturally feels too tired to take sufficient outdoor exercise. The time has arrived when women of all classes are demanding a higher or wider scope of life than that of kitchen cinderellas; and they have not been slow to appreciate the fact that gas is a useful assistant in this direction, and to welcome it accordingly.

We speak of our industry as a home industry in the sense that it employs local labour, and material to some extent; but it is also a home industry, because some 80 per cent. of the gas sent out from the gas-works is consumed in the home and under the superintendence of the mistress. Having this in view, it soon became evident, when attempting to promote the sale of gas, that the assistance of trained female talent was almost a *sine quâ non*. The first evidence of a general move in this direction was the employment of certificated ladies to give public cookery lectures or demonstrations; and for this the gas industry is indebted (as it is for many other things) to the enterprise of the makers of gas appliances. The leading gas-stove manufacturers had their permanent staff of lady lecturers long before gas companies thought of such a thing. Some of these ladies got into the way of visiting private houses; and from this beginning came the lady canvasser, inspector, or interviewer. Our principal gas undertakings now have quite a large staff of lady assistants, and there is scarcely one of any size that does not employ female labour occasionally if not permanently. Ladies are also employed at typing, clerical, and show-room duties.

A large supply of trained feminine assistance was, therefore, available for the work connected with the recent National Gas Exhibition, and a glance at the official guide book shows that it was fully utilized. No doubt this had a great deal to do with the generally admitted success of the enterprise. There was a fair proportion of lady attendants at the stalls—all of them, I believe, permanent gas employees lent for the occasion. The cookery demonstations (twice daily throughout the month) were, of course, left entirely to the lady professional. There were also popular lectures daily; and at four of these a lady took the floor. Out of the twenty-seven papers submitted at the conferences, six were written by ladies. And last, but not least, Mrs. M. A. Cloudesley Brereton took a prominent part in the whole of the extensive literary work. The exhibition itself was a practical demonstration of the part that woman is taking, and will take, in the development of our industry. Incidentally, we may observe that in addition to the direct employment of female labour, the gas industry has indirectly encouraged it among manufacturers. A large proportion of the demonstrators showing the technical applications of gas were women. The manufacture of incandescent mantles is almost exclusively a feminine occupation.

Nor can the gas man afford to ignore the domestic servant, who is a power in the land, that may be a useful friend, or a foe to be reckoned with. The mistress rules the house, and in some things the servant rules the mistress. The master has a word to say once in a way. If a servant expresses a desire to have a gas-cooker, and gives satisfactory reasons, the chances are she will get it. But it would take an uncommonly courageous mistress to put one in after the monarch of the kitchen had emphatically announced that she could not "abear them things." The gas-cooker in particular is to a large extent at the mercy of the cook, who may or may not be personally interested in the extent of the gas bill. Both the efficiency and the economy of the appliance depend largely upon the care and judgment exercised in its daily use, and the extent to which it is kept in a sound condition as regards cleanliness and general repair. One cook will carry out a given quantity of work with 1000 cubic feet of gas, and another would use 4000 or 5000 cubic feet. It was a custom at the earlier demonstrations to fix on the platform a meter with a large index to show the quantity of gas used, and the very small quantity indicated was a matter of much surprise. When ladies saw that an amount of work equivalent to about a week's household requirement could be and was carried out on the public platform with about three pennyworth of gas, they applied a simple sum in proportion to their own gas bills, and some went so far as to say that the morals of the meter or of the manager must be seriously at fault. This was a distinct case of putting the saddle on the wrong horse. The chief factor in the difference is waste of gas through sheer negligence—such as leaving burners full on for half-an-hour after they are done with, lighting up a 6-inch burner, equal to, and intended for, a four-gallon pot, for the purpose of boiling an egg or warming half-a-pint of milk. When an unnecessarily large burner is used, and the flame not only covers the bottom of the vessel, but tails-up the sides and even over the top, there is not only a large waste of gas, but the metal is burnt and injured. There is not only an unnecessarily high gas bill, but an equally unnecessary large account for repairs and renewals of kettles and-pans, all of which is set down to the credit, or rather the discredit, of the gas or the gas company, instead of to the real cause. It should also be observed that the lady demonstrator takes care to use vessels of the right shape, size, and material for the various requirements, whereas many gas consumers have an odd lot selected at haphazard. The makers of apparatus are a little loose in this respect, for I have seen in their illustrations of gas-cookers in use an array of utensils on the top that, to say the least, are not the best suited for the sizes of the various burners. The lady demonstrator accurately adjusts and regulates the taps in use, and never leaves one alight that is not required.

It is true that one does not now meet with the cases of flagrant ignorance that were not unusual when the gas-cooker was still in its infancy. Both the stoves and the users have improved with experience. With the spread of education and the extensive use of gas in cookery schools and classes, the average servant to-day is competent to deal with gas consumption in an intelligent manner. But there is a lot of room for intelligent instruction in the matters above named—such as not using gas to waste, suiting the burner and the utensil to the work to be done, in using the taps as regulators, something more than mere on and off stop-valves, and extending the same care and cleanliness to the cooker and the gas appliances that is bestowed upon the furniture and other appurtenances in the house. Why should a man from the gas-works be sent for to clean a cooker? It is remarkable that while people clean, repaint, and repolish everything about the house at least once a year, gas lighting and heating fixtures are frequently served much the same as the Indians do their crockery—they are too lazy to wash it—but smash the whole lot once a year and replace it with new. At this period of the year we occasionally hear of the "smell" from a gas-fire or gas-burner, which turns out on inquiry to be nothing to do with the gas, being

simply the scorching of six months' accumulation of dust, dead insects, and such like rubbish that has collected during the summer. How many gas appliances, like the Indians' crockery, never get a proper clean up from the time they leave the store till they are carried to the old metal heap? Then there is the bye-pass flash-light, which was introduced for the purpose of economizing gas, but is now more generally regarded as an improvement on matches. It seems an obvious absurdity to burn a flash for twenty hours, or perhaps for a week, simply to save the labour of striking a match. We talk about turning off the cooking burners when not required; but how frequently we find that a burner is lit up at dusk regularly and left alight till 11 p.m., when it is not really required or in use for half-an-hour. If the consumer likes to have his house in a blaze of light from cellar to attic, and is willing to pay for it, the gas company need not object. But the awkward part is that the insidious canvasser for other systems sometimes gets a sight of the bill and compares it with an estimate strictly based on the hours of use only. The idea of the flash was that the gas would be turned down when it was not wanted, perhaps three or four times during the evening, the flash serving as an easy indication of the locality of the switch or tap. All these things are to a large extent under the control of the domestic servant.

The house servant of to-day will in all probability be mistress to-morrow, and after experiencing the advantages of gas in her "place" will desire to have the same in her home. The slot-meter agreement brings all the advantages of gas within the reach of every weekly wage earner. Every gas inspector can reckon up dozens or hundreds in his district who, after spending some years in domestic service, have set up a home on their own account. So the astute gas man will take off his hat to every servant, not only on account of the present, but in view of the possibilities of the future. And the Committee of the National Gas Exhibition were well advised in offering special inducements and attractions to the domestic servant; and in this, as in many other of the arrangements, we recognize the feminine element.

ORIGIN AND WORK OF THE BRITISH COMMERCIAL GAS ASSOCIATION.

A MESSAGE TO AMERICA.

It may be remembered that Mr. F. W. Goodenough, the Chairman of the Executive Committee of the British Commercial Gas Association, was invited by the President of the American Commercial Gas Association (Mr. C. Willing Hare) to attend the conference of that body, of which he is a member, held in Philadelphia early this month. To his great regret, he was unable to do so; but, though much pressed with the business of the National Gas Exhibition, he found time to send over an account of the origin and work of the Association with which he is so closely identified. Although this is fairly well known to "Journal" readers, we give Mr. Goodenough's story, as told to his colleagues across the Atlantic. It appears in the "Bulletin" for the current month.

Origin of the Association.

First of all, it may be of interest to trace briefly the history of the inception of the Association. At first it was purely a co-operative advertising proposition. For some years the most progressive men in the gas industry in England had been feeling the want of adequate publicity on general commercial lines for the service which the gas industry was in a position to offer to the public.

Something, it is true, had been done locally in the way of publicity, but not very much; for it must be confessed that in this matter of commercial propaganda England was at one time very considerably, and still is in a lesser degree, behind the States. A small beginning was made in London some eight years ago by the insertion of advertisements in weekly illustrated periodicals published in the city, but having a very considerable national circulation; and in this work the makers of gas appliances co-operated to some extent.

The undertakings outside London began to feel the benefit of this publicity work, and to see that it was not fair that one undertaking only should bear the major portion of the expense. They also began to realize that the industry would benefit greatly if the work that had been begun in a comparatively small way were widely extended.

At the meeting of the Institution of Gas Engineers in Dublin in 1907, I had the honour of presenting a paper upon the question of developing the sale of gas, to the discussion upon which Mr. R. M. Searle made a valuable contribution. In the course of the discussion a number of members of the Institution bore testimony to the fact that their undertakings were benefiting by the advertising in periodicals of general circulation which was then being carried out by the means I have indicated. The opinion soon became widespread that the time was ripe for co-operation by the undertakings throughout the country for the purpose of organized publicity work.

The question was ultimately definitely raised by the Commercial Section of the Southern District Association of Gas Engineers and Managers, and a conference to discuss the whole question on national lines was then called of the various Commercial Sections—which I may mention are organizations for the joint consideration of questions relating to the purchase of coal and the sale of bye-products, rather than for the development of the gas sales side of the industry.

This conference having decided that a national publicity movement was desirable, the question was taken up by the Council of the Institution of Gas Engineers, and subsequently by the Council of the Society of British Gas Industries, which represents the manufacturers of gas plant and appliances. It having been found to be not within the powers of the Institution to elect to a Publicity Committee of the Institution, as voting members, those who were not members of the Institution, but were essential to the success of the movement, it became necessary, as some of us had for some time felt it was desirable, to found a separate body to organize and carry into execution a scheme for co-operative publicity work. The British Commercial Gas Association was thereupon founded in October, 1911, and began active service for the industry in March, 1912.

The basis of contribution by undertakings supporting the movement was fixed at 2s. 6d. per million cubic feet of gas made per annum; and when the Association started it had the support of 220 undertakings, representing, if measured by output, rather less than one half of the total gas industry of the country.

It might be argued that the Association ought not to have started upon a campaign of advertising that benefited every single gas undertaking throughout the country until every one of the undertakings had agreed to bear its share of the cost. But if we had waited until this condition had been fulfilled, we should have been waiting still, because many undertakings required the evidence of the benefit that would accrue to the industry from the operations of the Association before they would support it; and this evidence could only be provided by making a start. That we have been justified in the event is proved by the fact that we are now supported by 77 per cent. of the gas industry in this country measured by volume of output, and that this support increases steadily month by month.

It should be mentioned that membership of the Association is confined to representatives of the subscribing undertakings nominated by those undertakings; their representation varying with their contribution, though not strictly proportionately, as it was not considered desirable by the largest gas undertakings that they should have such outstanding representation as to overbear altogether the representatives of the smaller undertakings.

The large companies and corporations felt that, unless substantial agreement prevailed among members of the Association as to policy, the work would soon come to an end, and that they were always in the position of being able to withdraw their financial support if any policy was adopted by the majority with which they were unable to agree. So far, at any rate, they have had no cause, and I believe they never will have cause, to regret the fact that they conceded to the smaller gas undertakings a larger representation than they would have received if representation had been strictly proportionate to contribution.

The following is the rule under which the subscribing undertakings nominate members of the Association:

Each subscriber shall have the right to nominate representatives as members of the Association according to the following scale:—

Subscribers contributing per annum—

Under £10	.	1 member	£751 to £1000	.	7 members
£10 to £50	.	2 members	£1001 ,, £1250	.	8 ,,
£51 ,, £100	.	3 ,,	£1251 ,, £1500	.	9 ,,
£101 ,, £250	.	4 ,,	£1501 ,, £1750	.	10 ,,
£251 ,, £500	.	5 ,,	£1751 ,, £2000	.	11 ,,
£501 ,, £750	.	6 ,,	Over £2000	.	12 ,,

In addition to the members so nominated, there are associate members nominated for election by the General Committee by the subscribing gas undertakings; such associate members being entitled to attend general meetings, but have no voting powers. There is, furthermore, a class of international members subscribing 21s. per annum.

Aims and Methods of the Association.

The ultimate aim of the British Commercial Gas Association is, put briefly, to increase the sale of gas throughout the United Kingdom. It seeks to achieve this end by the employment of such methods of publicity as its means permit for making better known to the public the many uses and advantages of gas, and for overcoming those lingering prejudices against its use which

are founded on ancient theories that have no relation to modern conditions.

It is realized that local effort can do and has done much in this direction; but it has become more and more evident that local effort, however excellent, cannot possibly do all or nearly all that needs to be done to defend and forward the interests of the industry. The Association, moreover, aims not only at augmenting local by national publicity work, but also at being of material assistance in the carrying-on of local campaigns, by placing the services of first-class advertising experts within the reach of all, and by providing the individual undertakings with high-class advertising matter at wholesale prices.

When it is said that local effort cannot possibly do all that needs to be done to forward the interests of the industry, we have in mind particularly the necessity of centralized efforts for dealing with and informing educational, medical, architectural, sanitary, and other authorities (to say nothing of the Municipal and Government Departments)—work which may be, and is, of widespread and incalculable value, but which obviously cannot be undertaken by any one company or corporation.

The Association has already done much to arouse interest among the professional, scientific, and learned classes, by means of the distribution of suitable literature, and also by the holding of receptions for the members of the medical, architectural, sanitary, and kindred societies in connection with the annual conferences. At these receptions lectures have been given by expert outside authorities on the scientific and hygienic aspects of the application of gas; and much has been done to stimulate public opinion on the important question of coal smoke abatement, which is of such vital importance to big industrial centres.

We find that physicians, architects, and educational authorities are, in an increasing measure, consulting us upon problems of lighting, heating, and ventilation; and we believe that in this way we are laying the foundation for a big development of the gas industry in this country in future years.

For the purpose of assisting individual undertakings to do their local publicity work at less cost, with less trouble, and with less worry to the local manager, the Association publishes from time to time illustrated examples of advertising matter suitable for insertion in local newspapers, in bazaar, concert, or theatre programmes, in church, chapel, or similar magazines, and in other local advertising media. These suggestions are issued well in advance of the seasons of the year to which the advertisements specially apply, and local undertakings are able to buy blocks of the illustrated advertisements at very moderate prices.

The Association also supplies editorial matter and articles likely to be of interest to the readers of local papers, which the managers of subscribing undertakings can and do arrange to get inserted in the papers circulating in their districts.

The Association also provides for its subscribers a very large assortment of booklets, leaflets, picture postcards, showcards, posters, and other advertising matter designed to further the sale of gas, at prices far below those at which the individual undertakings acting for themselves alone could get them produced and printed. This service is being taken advantage of to a steadily increasing extent by the subscribing undertakings, and during the year ended the 30th of September last 2,600,000 pieces of advertising matter were sold by the Association, as against 700,000 in the first six months of its work.

The Association has also been able to arrange for scientific research work to be carried out on the relative hygienic advantages of different methods of heating, which, I may add, has proved conclusively that the system of heating by convection, which directly heats the air of rooms, is far less satisfactory from the hygienic standpoint than heating by radiation from incandescent bodies in the room (such as open gas-fires), which heat the objects and only indirectly raise the air temperature. This research has done much to stimulate the interest of the medical profession in gas-heating, and to win their cordial approval of the modern type of gas-fire, which gives off the greater proportion of its heat by radiation from incandescent fire-clay.

Another direction in which the Association has proved of value to its supporters (and indeed also to its non-supporters) has been by acting as watch-dogs for the industry.

The Association has never taken up an aggressive attitude. It has always sought to be rather *pro*-gas than *anti*-electricity or *anti*-anything; believing that it is soundest commercial policy to talk about your own goods rather than to criticize those of your competitors. When, however, these competitors set out to deliberately attack you by the publication of false statements, it is essential that there should be some central authority to place the facts before the public; and this is a task which the Association has undertaken from time to time with satisfactory results—the most satisfactory result being that there are fewer such misstatements in circulation to-day than there used to be.

The Association has also rendered service by providing a Bureau of Information and Advice both to the public and to the industry; and we are being consulted on both hands to a steadily increasing degree. The public come to us for information and advice very often, because they do not feel complete confidence in the ability or desire of the local undertaking to advise them in their best interests; and though their want of faith in the local undertaking is generally (though by no means always) unfounded, it is an advantage to the undertaking in such circumstances that their consumers should be advised on sound lines by a body in which their consumers have faith. It is, of course, very often not so much want of faith in the local company that sends the consumer to us, as the belief that, representing as we do the industry of the whole country, we shall have more complete information than any individual gas manager.

Besides the various services which the Association is able to render to the industry, which I have endeavoured very briefly to indicate, there are two other very important services which it has rendered and is rendering—services which the National Commercial Gas Association has rendered to the industry in the States from its inception, and which, indeed, it was, I believe, primarily founded to provide. These two services are, first, that the Association has brought together periodically the gas administrators of the country for the interchange of opinions and experience and the discussion of all matters of common interest connected with the commercial development of the industry; and, second, that—by its establishment, by the holding of its conferences, by the circulation of its "Bulletin," and by the distribution of its literature—the Association has roused the directors and administrators of a great many of the gas undertakings in the country, both private and municipal, to the realization of the fact, which they had not previously appreciated, that it is not merely necessary to make gas economically, but to sell it efficiently, if their undertakings are to go forward in the future as rapidly as, or more rapidly than, in the past.

Even to this day there is a certain, though happily a lessening, number of gas administrators and even gas managers—though there are a very few of the latter—who say: "Look at the past! The gas industry has made wonderful progress; increase of sales has succeeded increase, prices have gone down, dividends have gone up. We have done and are doing very well indeed. Why worry so much? Why all this to-do about 'development' and 'progress'?"

Fortunately, however, one by one these out-of-date boards and committees are waking up—and the Association is doing much to bring about this awakening—to the fact that, with the increasing strenuousness of competition, with the ever-growing demand of the public to be given willing and good, instead of grudging and indifferent, service, modern commercial methods must be adopted if progress is to be improved or even maintained; and that, even where competition is not severe, and where the public is content, it is foolish to be satisfied with good results, if by the adoption of improved methods you can obtain better.

New ideas are stirring throughout the industry in this country; fresh life-blood is coursing through its veins; activity is taking the place of sloth and indifference in every direction; and last, but by no means least, the spirit of co-operation for mutual benefit, both between one gas undertaking and another, and between the makers of gas on the one hand and the manufacturers of gas appliances on the other, is growing steadily every day, and is becoming a mighty engine of progress.

The recent National Gas Exhibition was run upon entirely co-operative and non-competitive lines, for the instruction of the public by the industry as a whole for the benefit of the industry as a whole; and the effect of this enterprise upon the sales of gas during the years to come it is difficult to estimate, and I think would be difficult to over-estimate.

In the creation of a spirit of co-operation the British Commercial Gas Association has played a leading part; and but for its establishment and for its demonstrations of the value of co-operative enterprise, such an exhibition, on such lines and of such magnitude, could not possibly have been carried through.

When one remembers that the Association has only been in existence for a little over two years, and has only been in active operation for considerably less than two years, those of us who assisted at its birth and fostered its growth may well feel encouraged by the extent of its present achievements. But we believe that, as with the National Commercial Gas Association so with the British Commercial Gas Association, the achievements of the past are as nothing to the possible achievements of the future, if the spirit of co-operation, faith, and enterprise which animates them both burns as brightly in the years to come as it is burning now; and I, for one, have no shadow of doubt that the spirit will burn, not with diminishing, but with increasing intensity as year follows year.

Sir William Preece's Property.—The late Sir William Preece, whose death was recorded in the "JOURNAL" for the 11th ult., left estate of the gross value of £32,320, of which the net personalty has been sworn at £22,074.

Coke and Briquette Manufacture in Belgium.—In the year 1912 there were in operation in Belgium 38 coke-oven plants, all situated in the provinces of Hainaut and Liège, with the exception of three, fitted with 2766 units and employing 3873 workmen. The total output of metallurgical coke amounted to 3,186,780 tons, or 25,000 tons more than in 1911; the average price per ton being 25·38 frs., against 23·26 frs. before. During the year, 61 factories manufacturing briquettes were at work, almost all situated in the province of Hainaut. They produced 2,690,610 tons of briquettes of a value of 54,019,250 frs., or 20·07 frs. per ton, against 17·15 frs. in 1911. The consumption of coal for coke and briquette manufacture represented 6,607,590 tons, or 27·7 per cent. of the total consumption of the country, after deducting the quantity consumed at the mines.

WATER AFFAIRS.

Review of the Principal Events of the Year.

In accordance with custom at this season, we review the principal events in connection with the supply of water which have been recorded in the "JOURNAL" during the past twelve months. With a few exceptions, they have not been of very great importance.

The Dry Summer.

In view of the dependence of the water supply of the country upon the extent of the rainfall, attention may, as customary in this review, first be given to the weather. The outstanding feature was the long drought in the summer. It extended over a period of two months, and the most unexpected places suffered to the greatest extent. Devonshire had scarcely a drop of rain, South Wales was parched, and all through the West Midlands the ponds dried up. The mountain streams in the Lake District were very shallow; and the level of Ullswater was lower than it had ever been known to be. In Cumberland the scarcity of rain had lasted three months. The drought had a serious effect upon the water supply of Glasgow. On the 16th of August there was only enough water for 60 days in Loch Katrine and the other lochs in the district; but, in addition, there was 17 days' supply in the two reservoirs at Milngavie—making 77 days' supply in all, compared with 117 days at the corresponding date in 1912. The Tay and the Tummel had never been so low. Fortunately rain came on the 21st of August, and palliated the drought, though it did not end it, as the greater part of the South of England was still suffering. The following figures give, in round numbers, the deficiency per acre below the average from the 1st of June until the date just named in England and Scotland: England—N.E., 305 tons; E., 222 tons; Midlands, 305 tons; S.E., 308 tons; N.W., 204 tons; S.W., 401 tons. Scotland—W., 405 tons; N., 301 tons; E., 306 tons. Everywhere the rain was greeted as a welcome relief. The weather in July and August was in striking contrast to that of last year, when rain fell in London in the latter month on twenty-five days out of thirty-one.

Work and Position of the Water Board.

A noteworthy feature of the year has been the direction of public attention to the subject of the water supply of the Metropolis in two unusual ways—an inaugural ceremony and a pageant. The former was the opening, by their Majesties the King and Queen, of the large reservoir, capable of holding 3000 million gallons of water, constructed at Chingford by the Metropolitan Water Board; the latter was an abridged reproduction of the Lord Mayor's Show of 1613, the year in which Sir Hugh Myddelton, the brother of the then Lord Mayor, completed his scheme for the supply of water to London from "the springs of Chadwell and Amwell and other springs in the county of Hertford." The reservoir was commenced on April 11, 1908, when Mr. E. B. Barnard, the present Chairman of the Board, who was then Vice-Chairman and Chairman of the Works and Stores Committee, cut the first turf. The extreme length of the reservoir is 1 mile 1190 yards; and it occupies an area, including the banks, of about 500 acres. The top water area is 416 acres, and the length of the embankment 4½ miles. The special feature of the undertaking is the pumping plant, which is unique in water-works construction, consisting as it does of a large installation of the pumps designed by Mr. H. A. Humphrey, M.Inst.C.E. This appliance may be regarded as a gas-engine and pump combined, and in it the action of the internal combustion cylinder is directly applied to the raising of water. The reservoir and auxiliary works were designed by Mr. William Booth Bryan, M.Inst.C.E., the Chief Engineer to the Board, and they were constructed under his supervision by Messrs. Charles Wall, Limited, at a cost of about £550,000. With regard to the pageant, it consisted of four groups—one being allegorical, and representing the New River as a captive giant; and another having reference to the Goldsmiths' Company, of which Sir Hugh Myddelton was a member. It was on the 30th of September, 1613, that the New River water was first brought to London, which had previously depended for its supply upon various conduits, a system of reservoirs at Hampstead, and the water-works in the arches of old London Bridge.

On the occasion of the opening of the reservoir, opportunity was taken of giving the large company assembled to witness it some idea of the magnitude of London's water supply. They were informed, in an interesting *brochure* specially prepared for the event, that the population served is nearly a million more than that of Australia and New Zealand together, and represents 15 per cent. of that of Great Britain and Ireland. At the census of 1911, the number was rather more than 6·6 millions. The average supply per head per day in 1911-12 was 36½ gallons; but in the summer it reached 42½ gallons. The quantity delivered to each house every day would weigh nearly a ton. The Board serve an area extending to 560 square miles; and the length of their mains is 6334 miles.

Turning from the work to the financial position of the Board, the subject of the deficiency of about £210,000 and the means of liquidating it came forward early in the year. The Board's proposal to obtain parliamentary authority for clearing it off having been defeated, they decided to issue precepts upon the constituent authorities; and Mr. A. H. Tozer, the Chairman of the Finance Committee, prepared and circulated a memorandum setting forth at some length the causes of the deficiency. The conclusion arrived at was that there was no possibility of equilibrium between receipts and expenditure being attained in the near future, but that deficiencies would occur for many years to come. At the same time, he submitted that the water supply cost the public, on an average "less than was the case under the Companies' administration." The proposal to issue precepts was not received kindly by the constituent authorities, who thought the Board should promote a Bill to remove any doubt as to the legal liability of the Metropolitan Boroughs to contribute towards liquidation of the accumulated deficiency. They also considered that the districts not represented on the Board that take a supply of water in bulk from the Board's sources should be made liable for a fair share of any deficiency in the finances. Early in April the Board gave notice in the "London Gazette" of their intention to apply to Parliament for authority to remove, by means of a clause to be inserted in their Various Powers Bill then in progress, any doubts as to their power to issue the precepts. The clause was duly inserted and sanctioned by Parliament.

The financial position of the Board was set forth by Mr. Tozer at a meeting held in the spring, when he presented the estimates for the year 1913-14. He said that the deficiency for the year then just closed would be approximately £72,000; and that for the ensuing year was estimated at £97,230. He remarked that the expansion of the Board's income was painfully slow; and they appeared to have travelled a long way from "the halcyon days of the Water Companies," when, during the five years before their undertakings were acquired by the Board, there were average increases of £66,000 per annum. He attributed the falling-off to the outward movement of the population, which had caused a "slump" in the building of new houses within the Board's area. The deficiency of £97,230 was larger than any yet experienced, and for the first time was greater than the sum set aside as a sinking fund. It was something less than ½d. in the pound, which Mr. Tozer thought was a very small contribution to be made by the general ratepayer for the communal benefits derived. The administration of the Board was ably defended by the Chairman (Mr. E. B. Barnard) in a lecture delivered by him at the Royal Sanitary Institute. Referring to the deficiency, he said it amounted to a net sum of £251,924. But he explained that during the Board's existence they had paid £373,518 into the sinking fund; so that, instead of a deficiency, imposed upon them only by the method of account-keeping fixed in their Act, they really had a surplus of £121,394. He claimed that where the Board could control expenditure they had kept it down, and had shown a moderation and prudence inviting comparison with the past.

Passing from the financial position of the Board to other matters which have engaged their attention, the inadequacy of their office accommodation at Savoy Court forced itself once more upon their notice; and at their meeting towards the close of July they had the question under consideration. The General Purposes Committee suggested two sites for central offices—one abutting on Gray's Inn Gardens, and the other on the Board's own land at the New River Head in Rosebery Avenue. A third site—in Belvedere Road,

Westminster Bridge Road, opposite the new County Council Hall—was mentioned, but not recommended. As the result of a discussion of the matter, it was decided to build on the Rosebery Avenue site; and at the meeting of the Board on the 12th inst., instructions were given to obtain plans for the necessary buildings, the total cost of which is not to exceed £80,000. Some complaints were made in the spring with regard to the quality of the water supplied in the west and north-west districts of London. The matter was investigated by the Director of Water Examination (Dr. A. C. Houston); and the disagreeable odour and taste complained of were definitely traced to the development of certain species of algæ. As the result of steps taken by him in conjunction with the Engineer, the trouble was soon entirely overcome. It is scarcely necessary to say that an attempt was made to get up a "scare" over the occurrence. Dr. Houston and his staff keep strict watch over the quality of the water supply, as testified by the reports issued by him from time to time furnishing a detailed account of his researches. With regard to the general work of the Board, there is practically nothing to add to the particulars extracted from the latest annual report—for the year ended the 31st of March last—which were given in the "JOURNAL" for the 2nd inst.

THE BOARD'S LITIGATION.

The Board have unfortunately not been free from litigation—indeed, freedom could hardly be expected in view of the magnitude of the undertaking; but only a few cases call for notice. The most important was certainly the one which revived the old question of the "domestic" use of water—this time in connection with the business of a licensed caterer. The amount in question was only 5s.; but the principle involved was of wide application. The defendant—a Mrs. Avery—carried on business in John Street, Minories; and in May last year the Board sought to recover the above-named amount, the equivalent of two quarters' water-rate on the non-domestic scale. Their contention was that, as there were about thirty luncheons served on the premises every day, the water used for cooking, drinking, and the washing of utensils, &c., was employed for the purpose of trade. It was submitted, on the other hand, that catering had been done ever since the house was licensed, and the owner had never been charged anything beyond the amount of the ordinary water-rate. The action was tried in the first instance at the Westminster County Court; and his Honour Judge Woodfall said he thought his decision must be for the plaintiffs. At the same time, the point raised was so important that he considered an authoritative pronouncement should be obtained upon it by a Higher Court. He accordingly gave leave to appeal. The question came before Mr. Justice Channell and Mr. Justice Bray in the King's Bench Division early in March; and their Lordships allowed the appeal, but gave the Board leave to take the case further. The appeal was argued before Lords Justices Vaughan Williams, Buckley, and Hamilton, who unanimously dismissed it, with costs. The Board then sought the opinion of the House of Lords, who, at the conclusion of the arguments for the appellants, did not consider it necessary to hear those for the respondent.

In the Shoreditch County Court, a tavern keeper in Dalston Lane sued the Board for £35 13s. 8d. in respect of damage done to a cob through it catching its foot in a hole which was not visible to the plaintiff as he was driving. The hole was 9 inches deep and full of water, which it was alleged came from a burst main. For the defence, it was stated that the main had not burst at all, and that the injury had occurred to the communication-pipe, for which the owner or occupier of the premises supplied was liable. None of the men in the employ of the Board had anything to do with the repair of the hole, for which the local authority was responsible. His Honour Judge Cluer agreed that the pipe which had caused the trouble had nothing to do with the Board, and therefore he could not see any duty upon them to do something to a pipe not belonging to them. He said there must be a verdict for the defendants, with costs; but he gave leave to appeal. In another case, in which a sum of £97 was claimed for damage to a motor lorry through the subsidence of a road, the Board were declared to be liable. The lorry, while passing over a piece of road in Kensington which had been opened, and was to be opened again, by the Board to effect some repairs, sank into the ground up to the axle. A pipe owned by the Gaslight and Coke Company was broken, and the escaping gas ignited and damaged the lorry. It was contended that the Board were not liable, as they had given the Local Authority the statutory notice of their intention to open the road, and that their responsibility ended there. The case came before his Honour Judge Woodfall, at the Westminster County Court, who gave judgment for the plaintiffs (the Associated Coal Consumers, Limited), on the ground that the Board undertook the repair of the road instead of delegating the work to the Kensington Borough Council.

The question of the period allowed for the recovery of water-rates was before a Divisional Court towards the close of the past year, and before the Court of Appeal this last summer. The action was brought by the Board, in the Westminster County Court, against the owner of three houses at Brixton. The rates were due down to the quarter ended Sept. 30, 1908; so that a period of more than six months had elapsed after the last rate became due and before the action was brought. The Judge had decided against the Board on a preliminary objection to the claim; and they appealed. The arguments on both sides were heard by Mr. Justice Ridley and Mr. Justice Scrutton, who did not think the decision of the County Court Judge could be supported; and they sent the case back to him, to hear and determine it, with the expression of the opinion of the Divisional Court that the six months' limitation did not here apply. They, however, gave leave to appeal; and the case was heard by Lords Justices Vaughan Williams, Buckley, and Hamilton, who upheld the decision of the Divisional Court, and dismissed the appeal, with costs.

The supply of water to builders was the subject of litigation in which the Board were unsuccessful. The action was originally brought in the Westminster County Court in the following circumstances: Defendants, under a contract with the War Office, erected a building at the Hounslow Barracks; and it was a term of the contract that the water for use in the operations should be supplied free of charge—the water being measured by the meter in the ordinary course, and paid for by the War Office. The Board, under section 17 of their Charges Act, claimed the sum of 15s.—being at the rate of 7s. per cent. on the probable cost of the building; and it was allowed. Thereupon the defendants appealed. Mr. Justice Channell thought that they were not persons who required a supply of water within the meaning of the section, and therefore that the action was not maintainable. Mr. Justice Avory, on the other hand, considered that the meaning of the section was that a builder who needed water for his operations must make a request for it to the Board, and pay the special charge. As their Lordships differed, the appeal was dismissed; but leave to appeal further was granted. The case was argued before Lords Justices Vaughan Williams, Buckley, and Hamilton in June, with the result that the appeal was allowed, and judgment ordered to be entered for the defendants.

SCHEMES OF IMPROVED WATER SUPPLY.

Apart from the completion of the Chingford reservoir, already referred to, there is little to record in the way of the successful carrying-out of schemes of improved supply; nor were many of much importance commenced. Taking the events in the order in which they occurred, early in the year the Merthyr Corporation accepted a tender at £232,000 for the construction of a storage reservoir in the Taff Fechan Valley. It will impound the waters of this river and its tributaries, form a lake 2½ miles long, and be very nearly large enough to equalize the flow of the whole drainage area of 8350 acres. In March the Water Committee of the Glasgow Corporation resolved to recommend the extension of the Loch Katrine water-works by the acquisition of the water rights of Loch Voil and Loch Doine, and construct new works. It was estimated that this scheme would bring in between 40 and 50 million gallons of water, and raise the total to upwards of 130 millions, which it was stated would be ample for the possible future requirements of the city and district. Important schemes for the development of the water supplies of the West of Fife and the Burgh of Dunfermline were considered by the Commissioners early in April, under the Private Legislation Procedure (Scotland) Act. The yield of water would be about 12 million gallons per day; and the cost was estimated at £146,000. Shortly afterwards the Corporation of Sheffield decided to proceed with the construction of the Broomhead reservoir as the first instalment of the Ewden Valley water scheme. This would, it was stated, take four or five years to complete, and then they would start the second reservoir. A new water

supply for Bocking, provided by the Braintree Rural District Council, was inaugurated on the 12th of April. A few weeks later the Countess of Aberdeen opened new water-works which had been constructed, at a cost of about £9000, for the supply of Warrenpoint, a favourite pleasure resort at the head of Carlingford Lough. About the same time a scheme of water supply for Cumberland was completed at a cost of £10,000. The inaugural ceremony consisted in the opening of a filter-house and reservoir in connection with a project of the Aspatria, Silloth, and District Joint Water Board, under which practically the whole area of North-West Cumberland is supplied with water for domestic purposes. The latest addition brought up to £68,000 the total capital expenditure upon the scheme since its inception twelve years ago. An interesting piece of engineering work was carried out near Yarmouth in the summer, when a couple of steel tubes 100 feet long were sunk in the river bed as part of a development of the distributing plant of the Great Yarmouth Water Company.

In the middle of September the parishes constituting the area of the Clowne Rural District Council were formally put in possession of a new water supply, which had been carried out at an estimated cost of £41,500. The proceedings marked the consummation of a project which had been more or less under consideration for about twenty years. The supply is derived from the pumping well of the Wigan Coal and Iron Company at their Manton Colliery. It is new red sandstone water, with a hardness of 14° to 15° per gallon; and it has been reported upon as "extremely pure and suitable for public supply." The available quantity at Manton is 2 million gallons a day; and the scheme provides for an increase of population from 18,000 to 27,500, requiring 412,500 gallons daily. Early in October new water-works for the supply of Ryde were formally opened by the Mayoress (Mrs. Blackall). The extension was commenced in 1909, and the expenditure upon it will reach £18,000 or £19,000. The average annual consumption is estimated at 250 million gallons; but as the yield is 450 millions, there is ample margin for all possible increase for many years. A few weeks ago the Doncaster Corporation gave their assent to an agreement with the Leeds Corporation for an additional supply of water. The quantity to be furnished daily is 500,000 gallons, at the rate of 8d. per 1000 gallons, with the option of its increase to 4 million gallons per day. On the minimum basis of supply, Doncaster will have to pay Leeds £6000 per annum; and it is estimated that the borough is assured an adequate supply of water for the next fifty years. Under the terms of a will, the Newry Urban District Council have been put into possession of about £60,000, a portion of which will be spent in removing some of the difficulties connected with the town's water supply. In connection with the Vyrnwy water scheme, the Lord Mayor of Liverpool (Mr. H. R. Rathbone) recently declared open a new balancing reservoir, of a capacity of 4½ million gallons, at Malpas, in Cheshire.

Other schemes have been carried out, commenced, or are projected for improving the water supply of a number of places which need not be enumerated. During the year Local Government Board inquiries have been held with respect to applications from Abingdon, Barkisland, Craven Arms, Dublin (County), East Cowes, East Dereham, the Evesham District, Exmouth, Holywell, Howth, Killaloe, Morley, St. Helens (Isle of Wight), St. Helens (Lancs), Selby, Sleaford, Topsham, Wath, Widnes, Winchcombe, and Witney. An inquiry was also held in regard to a proposal for an exchange of areas between the Corporation of Bacup and the Bury and District Joint Water Board; and one respecting a loan for a third pipe-line from Wales for Birmingham.

Legislative Matters.

The general water legislation of the year has been so recently noticed, that no further reference to it is necessary; but a few matters which may possibly result in a change in the law call for some brief notice. At the meeting of the House of Commons on the second day of the New Year, Mr. Samuel Roberts, the Member for Eccleshall, asked the President of the Local Government Board whether, with a view to conserving, apportioning, or regulating the available water supplies of the country, he would consider the advisability of Parliament setting up a national water authority; or whether, having regard to the importance of the subject, he would appoint a small Committee of water experts to inquire into, and report on, the necessity of such action being taken. In reply, Mr. Burns said that he had in preparation a Bill dealing with the subject. The Board had been engaged in collecting a large amount of valuable information in regard to the existing sources of water supply; and he had appointed a geologist on the staff of the Department with particular reference to the matter. The information gained in this way, and also from the researches of the Geological Survey, could not fail to be of service in the consideration of questions such as those to which reference had been made. A few weeks later the Prime Minister announced that there was no possibility of the Public Health (Acquisition of Water) Bill becoming law in the session. The purpose of the Bill was, as explained by Mr. Percy Griffith, the Secretary of the Institution of Water Engineers, in a letter to the "Journal," to enable Rural District Councils to compulsorily purchase "water rights" in streams. At present these Councils cannot legally promote Private Bills; and their powers as to compulsory purchase are confined to land. The Bill would have enabled them, by Provisional Order from the Local Government Board, to acquire compulsorily water supplies as well as land. Mr. Griffith regarded the holding-over of the measure as a serious matter, as the public health was affected. In the next issue, however, Mr. R. L. Badham, the Secretary of the Provincial Water Companies' Association, pointed out that the Bill contained far wider powers than those indicated. It did not, he said, give any protection to water companies; and consequently, if it became law, any local authority could apply for a Provisional Order which would enable them to compete with an existing water company without reference to the ratepayers. In a further letter, Mr. Griffith explained that, while he was in sympathy with the main purpose of the Bill, he by no means intended to support it in the exact form in which it was drafted. His regret was that it was not advanced sufficiently to enable its bad points to be eliminated and its good ones incorporated in an Act. The Bill was afterwards withdrawn.

The subject of the water resources of the country came up in the summer in the House of Commons, sitting as the Committee of Supply, on the consideration of the vote of £185,988 to complete the sum required for the salaries and expenses of the Local Government Board. It was introduced by Mr. Walter Long, a former President of the Board, who moved to reduce the vote by £100. He acknowledged that his successor in the office had done good work; but he complained that Mr. Burns had taken matters too much into his own hands—constituting himself the sole arbiter of what was good and what was bad for the local authorities. He submitted that greater advantage should be taken of the large experience and training possessed by the distinguished men with whom the President is now associated. Mr. Leif Jones considered the Board were open to criticism. The country should, he said, be mapped out, the sources of supply ascertained, and the water apportioned to the places requiring it. The Parliamentary Secretary to the Board (Mr. Herbert Lewis) said they were then dealing with about 3000 returns they had received from various authorities, and were extracting from them all the information bearing on underground water. They were also dividing the water among the different geological formations in every county in England and Wales, and preparing a statement of the quantity of water drawn by public authorities from each geological formation. Sir Mark Sykes called attention to the question of the water supply in rural districts. Mr. Burns, in the course of his reply, said he would be glad to do anything he could to safeguard rural water supplies from being unnecessarily raided by large companies and great towns. He believed it was possible to secure good supplies for rural areas and for serving the large towns. The amend ment to reduce the vote was lost by a majority of 77.

Legal Proceedings.

The general legal business in connection with the supply of water presented several points of interest which call for notice in reviewing the events of the year.

At the Hilary Sittings of the High Court of Justice, Mr. Justice Rowlatt and Mr. Justice Bailhache heard an appeal by the defendant in an action brought by the Mayor and Corporation of Saltash, and decided against them by his Honour Judge Lush-Wilson. The amount in dispute was only £1 9s. 2d.; but the case was a test one to determine whether or not the Local Authority were right in the way in which they were levying the water-rate. When the defendant (a Mr. Geake) went into his house in September,

1901, he signed an agreement to pay 1s. in the pound on the gross value up to £30, and 6d. in the pound above this sum up to £50. The house was rated at £45 net and £50 gross. In March, 1911, the plaintiffs, finding the sum received was not sufficient to cover the cost, determined to raise their charges; and for this purpose they sent out a notice terminating all existing agreements from and after the Midsummer quarter, and raising the rate to 1s. 2d. in the pound on the gross estimated rental of premises supplied. The defendant, in common with many other consumers, held the opinion that this was not a justifiable proceeding on the part of the Corporation. The plaintiffs were seeking to charge on the basis of an agreement which the defendant repudiated; and although there was no evidence of any implied agreement, the County Court Judge held that there was an implied undertaking to pay. Mr. Justice Rowlatt said that, in order to succeed, the plaintiffs had to prove an agreement, either expressed or implied; and this they had not done. The County Court Judge had gone wrong; and his decision should have been the other way. Mr. Justice Bailhache concurred. The appeal was accordingly allowed.

The old question of the liability of the Liverpool Corporation to be rated as beneficial occupiers of the gathering-ground in connection with their Rivington Water-Works was finally disposed of early in the year. The matter, it may be remembered, came in the first instance before the Justices at the Preston Quarter Sessions on an action by the Chorley Union and the Overseers of Withnell. A considered judgment was delivered by the Chairman (Mr. H. Worsley-Taylor, K.C.) in favour of the Corporation; but he stated a case for the opinion of the Higher Court. Both this Court and the Court of Appeal, however, decided that the Corporation were liable. All these proceedings have been duly recorded in the "JOURNAL." The Corporation then took the case to the House of Lords, where it was in the able hands of Mr. Balfour Browne, K.C., who contended that the Corporation did not beneficially occupy the land in question. They had possession, but it was not coupled with beneficial user; and therefore they were not liable to be rated. Mr. Macmorran, K.C., who followed on the same side, contended that the possession which the Corporation had of the property did not render them liable to be rated, because they did not occupy, or intend to occupy, it in any way that would bring them a profit. At the close of the arguments, the Lord Chancellor intimated that their Lordships did not desire to hear the Counsel for the respondents (Mr. Danckwerts, K.C., leading), and would consider their decision. This they gave on the 3rd of February in favour of the Assessment Committee and the Overseers. A few weeks later, however, a satisfactory agreement was come to between them and the Corporation. The terms of settlement, as approved by the Water Committee, were submitted to the City Council at their meeting on the 5th of March, and unanimously agreed to.

The question of the supply of water to separate houses came before Justices Ridley, Pickford, and Avory, in the King's Bench Division, in connection with an appeal by the South-West Suburban Water Company against a conviction for refusing to furnish a supply of water to seven houses at Southall. The respondent was the owner of the houses in question, which had hitherto been supplied with water by one service-pipe. As they were of the annual value of more than £10, he was not bound to pay the water-rate; but as it was not paid by either the owner or the tenant, the Company cut-off the water, whereupon the owner sent a cheque for the amount, and demanded that the supply should be restored. But the Company refused to reconnect unless a service-pipe was provided for each house. On the owner taking proceedings against them, the Justices convicted, but stated a special case for the opinion of the High Court. It was contended, on behalf of the appellants, that the severance of the connection, assuming it to have been lawful, really put respondent in the position of taking a new supply, and that they were entitled to say that it must be to each house separately. For the respondent it was submitted that, under the Water Companies (Regulation of Powers) Act, 1887—Forrest Fulton's Act—the cutting-off was unlawful, because the owner, and not the tenant, was liable for the water-rate, and in such a case the Company could not stop the supply for non-payment. The case had some months previously been before the Court, and had been sent back to the Justices to be restated. They found that the circumstances of the laying-on of the water were that an arrangement, which really constituted an agreement between the respondent and the Company, was come to by which the houses should be supplied with water and the rate compounded; that, though the rate was raised, the agreement was varied to this extent only; and that therefore the cutting-off was illegal. Their Lordships unanimously came to the conclusion that the decision appealed from was right, and must be affirmed. Mr. Justice Ridley said that in cutting-off the supply of water the Company committed an unlawful act, and in refusing to restore it until their regulation was complied with they put themselves in the wrong. The appeal was therefore dismissed.

In the King's Bench Division, towards the close of last year, Mr. Justice Bailhache gave judgment in an action brought by Messrs. Stanley Bros., Limited, colliery owners and brick and tile manufacturers, against the Nuneaton Corporation, to determine the price at which they could claim a supply of water. The plaintiffs contended that the price should be 2d. per 1000 gallons; the Corporation, on the other hand, said it should be 8d. The question turned upon the construction of a covenant in a conveyance; and the Court had also to consider two points of law submitted by an Arbitrator, to whom the matter had been referred, and who had, in substance, found in favour of the Corporation. He had stated his award in the form of a special case, with several alternatives; and the question for the Court was whether the award was right, and, if not, which of the alternatives should be adopted. It appeared that the claimants had for some years been paying the higher figure for their water; but they said they had done so in ignorance of their rights under the covenant. The matter was somewhat complicated; but, in the result, his Lordship decided that Messrs. Stanley were entitled to require the respondents to supply them with water at a price not to exceed 2d. per 1000 gallons. The claimants asked for the return of the money they had overpaid—viz., £2314. This the Arbitrator had reduced to £1718, by disallowing certain items; and his Lordship upheld him in so doing. He reduced the amount still further by reason of the Statute of Limitations, and made it £1426. Stay of execution was granted in view of an appeal. This duly came before Lords Justices Vaughan Williams and Hamilton and Mr. Justice Bray. Lord Justice Vaughan Williams held that the appeal must be allowed, because, under the covenant, no liability to supply at the lower rate arose until the Company gave notice to the Corporation that their own supply was exhausted, and that they required water for their works and colliery. No such notice had been given, and therefore the Company must pay for their water on the same terms as other consumers. The other learned Judges concurring, the appeal was allowed.

The Corporation of Swansea, as the undertakers for the supply of water to the borough of Ystradgynlais, acting under a Special Act incorporating the Lands Clauses Consolidation Act and the Water-Works Clauses Act, 1847, broke up the soil of a public road which was within the district of, and was repairable by, the County Council, and laid a water-pipe therein; and the road was then restored to its original condition. The whole of the work was carried out under the superintendence of the Surveyor to the County Council. Eight months after its completion, a portion of the road and the bank supporting it slipped into the adjoining river; and the Council repaired the damage, which was the result of laying the pipe, at a cost of £87. They then preferred a complaint before two Justices to recover from the Corporation the cost of repairing the damage; and it was allowed. A case was, however, stated for the Divisional Court, who held that the claim was properly made under section 28 of the Act of 1847, as being a claim for compensation for damage done in the execution of the undertakers' powers; that the compensation claimed was damages of which the recovery was not specially provided for within the meaning of section 85 of the Act; and that therefore, under section 140 of the Railways Clauses Consolidation Act (incorporated in both the General and Special Acts), two Justices had jurisdiction to ascertain and determine the damages. The Corporation appealed, and the arguments were heard by Lords Justices Vaughan Williams, Fletcher Moulton, and Buckley, who allowed the appeal. The defendant, who is the Surveyor to the County Council, thereupon took the case to the House of Lords, but without success.

A disputed water-rate assessment case which recently came before the Magistrates at the Slough Petty Sessions raised a rather unusual point. The Windsor Corporation

summoned a water consumer (a dairyman) at Eton for two quarters' water-rate to June 24; the charge being 10s. 6d. per quarter for domestic and 2s. 6d. for trade purposes. The defendant questioned the right of the Corporation to levy the water-rate on the particular assessment. It was levied under section 41 of the Windsor and Eton Water-Works Act of 1883, which provides that the rate for domestic purposes for a dwelling-house shall be 4½ per cent. on the gross yearly value in Windsor, 5 per cent. at Clewer, and 3½ per cent. at Eton. The Corporation were therefore entitled to charge in the present case 3½ per cent. on the gross yearly value of the premises. This was the only real point before the Bench. There were two grounds upon which the defendant disputed the claim—one being that the Corporation were not entitled to charge for the trade supply; and the other that they had no right to make rates on two different assessments. It was submitted on their behalf that they were entitled to differentiate, and that the defendant had only been charged on the fair valuation of his house. In the result, the claim for water for trade purposes was struck out, and an order made for the payment of the 10s. 6d.—the Bench considering the assessment a fair one. They did not express any opinion as to the different principle of rating assessments in Windsor and Eton.

Towards the close of 1911, the well-worn question of the supply of water to workhouses engaged the attention of Mr. Justice Eve in the Chancery Division of the High Court of Justice, in an action brought by the Bristol Guardians to obtain a declaration that, under the Bristol Water-Works Act, 1862, their workhouses and buildings in the parish of Bristol were entitled to a supply of water for domestic purposes at the rates prescribed in the Act, and not by meter. The defendants (the Bristol Water-Works Company) said that none of the premises in question were "dwelling-houses" within the meaning of the Act; and also that, as in April, 1905, the Guardians agreed with them to pay for the water at the price of 1s. per 1000 gallons, this agreement was still binding upon them. It appeared, however, that the agreement had not been sealed. Plaintiffs claimed that they were entitled to a supply of water for domestic purposes calculated at a percentage, on scales named in the Act, on the annual gross rateable value of the premises. His Lordship said the dispute turned upon the provisions of defendants' Act that water was to be supplied at certain rates to the "owners or occupiers of private dwelling-houses;" and the conclusion he had come to was that it would be impossible to hold that an institution such as one of those in question was what would answer generally to the expression "private dwelling-house." He therefore decided that plaintiffs had failed, and dismissed the action, with costs. The Guardians, however, were still of opinion that they were right; and they gave instructions to their Clerk to enter an appeal. This was heard by the Master of the Rolls and Lords Justices Fletcher Moulton and Buckley early in March last year. The arguments extended over two days; and at the close their Lordships reserved judgment, which was delivered a few weeks later. The Master of the Rolls agreed with Mr. Justice Eve, and thought that the Guardians' appeal should be dismissed; and Lord Justice Buckley concurred. Lord Justice Fletcher Moulton, however, as the result of his examination in great detail of the various sections of the Company's Acts, particularly of the charging section of the Act of 1862, came to the conclusion that the appellants were entitled to the declaration for which they asked, and to have judgment. The majority of the Court being against the Guardians, the appeal was dismissed. They, however, took the case to the House of Lords; and it was argued before Lords Loreburn, Atkinson, Parker, and Sumner early in the present month. At the close of the arguments, their Lordships reserved judgment.

A few arbitration matters may be conveniently noticed here. Mr. L. P. Nott, who had a contract with the Cardiff Corporation in connection with their Llwyn-on Water-Works, was prohibited and restricted by them from using explosives in connection with the excavation, owing to possible danger to the dam; and he made a claim for compensation for the extra manual labour he had to employ in consequence. The matter was referred to Mr. Walter Hunter, M.Inst.C.E., whose decision was to be final; and he ordered the Corporation to pay Mr. Nott £8240 in full discharge of all the matters in question—his original claim having amounted to £10,261. The King's Bench Divisional Court, consisting of Mr. Justice Channell and Mr. Justice Coleridge, had before them an application on behalf of the Sheffield Corporation to set aside an award made by Mr. C. A. Russell, K.C., in connection with the Derwent Valley water scheme, or, in the alternative, to declare that it might be remitted back for further consideration. The Arbitrator had construed the word "land," in section 85 of the Joint Board's Act, as meaning all land, whether or not it was for the joint use or benefit of the constituent authorities; and he made an order the effect of which was that Sheffield had to pay £55,927. They contended that he had come to a wrong conclusion on this and other matters. It was submitted, on the other hand, that the Arbitrator had rightly decided that the expenditure on land was to be shared in the ratio of the different proportions, and that all parties were equally interested in carrying out the entire scheme. Their Lordships upheld the award.

Arbitration proceedings took place in London on a claim for £43,000 made by the Duke of Devonshire against the Derwent Valley Water Board in respect of easements through Chatsworth Park for laying mains to convey water for supplying Sheffield, Derby, Nottingham, and Leicester. The Board considered that the Duke was entitled to £5801 only, and that certainly £6000 would meet the case. The Umpire was Mr. C. A. Russell, K.C., the standing Arbitrator for the Board; and he awarded the Duke £14,920. Awards were also made in arbitrations relating to Church Stretton (£17,850) and Dawlish (£5070).

Technical Business.

Coming to the technical matters connected with water supply which have engaged attention during the year, the two meetings of the Institution of Water Engineers first call for notice. At the summer meeting, which was held at Wakefield early in June, under the presidency of Mr. C. Clemesha Smith, M.Inst.C.E., the Water Engineer to the Corporation, the members received a cordial welcome by the Deputy-Mayor (Councillor Marriott), on behalf of the Mayor, who was unavoidably absent on the town's business. In his Inaugural Address, the President suggested that the utility of the Institution might be increased by the co-ordination of experimental work—to constitute it a "clearing-house," so to speak, for handling some of the many problems to which water engineers devote time and thought. He gave as an example the effect of incrustations on the carrying capacity of mains. He directed the members' attention to two phases of the water question which he thought might be useful to them—viz., the methods of purification adopted at Wakefield and the plumbo-solvent action of water and its prevention. The bulk of the address, however, was devoted to a subject of far wider interest—*i.e.*, the control and allocation of sources of supply. The President was heartily thanked for his address, which was followed by a lecture by Professor Percy F. Kendall, of the Leeds University, who gave an indication of the general character of the water supplies derived from underground sources in the region of Yorkshire which includes the Calder Valley. Four useful papers were submitted—viz., "The Valuation of Water Undertakings on Transfer to Local Authorities," by Mr. Edward J. Silcock (held over from the winter meeting last year); "The Water Supply of Jersey," by Mr. Alfred J. Jenkins; "Animal Growths in Water-Pipes," by Mr. Samuel C. Chapman; and "Reservoir Storage in Relation to Stream Flow," by Mr. W. J. E. Binnie and Dr. Herbert Lapworth. Some interesting visits were paid. The members were hospitably entertained on their visits, and spent an enjoyable evening together on the occasion of the annual dinner. The one sad incident in the whole proceedings was the reference to the loss the members had sustained by the death of Mr. Easton Devonshire, their colleague and friend, whose wide experience and business capacity enabled him to do so much towards promoting the interests of the Institution, ever since its formation.

At the winter meeting, which was held in London on the 13th inst., four papers were submitted—viz., "Compulsory Returns by Water Undertakings," by Mr. John Chisholm; "Portland Urban District Council Water-Works," by Mr. R. Stevenson Henshaw; "Solubility of Carbonate of Lime and its Bearing upon the Treatment of Water Supplies," by Mr. W. T. Burgess; and "Treatment of Plumbo-Solvent Water by Mechanical Filters," by Mr. F. J. Dixon—and they led to good discussions. We gave last week the paper by Mr. Chisholm; the remainder will appear in due course. At both meetings additions were made to the membership

roll. The new President is Mr. Thomas Molyneux, of Stockport, and the next meeting will be held there.

The Municipal Water-Works Association, which was formed last year, held its second annual meeting in Glasgow early in October, under the presidency of ex-Bailie Archibald Campbell, who was formerly Convener of the Water Committee of the Corporation. In the course of his address he stated that the membership of the Association numbered 121, representing 45 water authorities supplying a population of 16¾ millions, with a capital expenditure of £105,500,000. When the Association started, the membership was 99, representing 37 water authorities supplying a population of 15,665,000, with a capital expenditure of £101,000,000. The Executive Committee presented a report in which they stated that one important matter they had carefully considered was the proposal to establish a central administrative authority "empowered to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint, and also to serve as an authoritative adviser to Parliament in the consideration of particular schemes." The Committee felt that the Association should cordially support the suggestion contained in the report of the Joint Select Committee on the Water Supplies Protection Bill, 1910, that "there is urgent need for a survey, at once comprehensive and in detail, of the water supplies and water needs of the country, and for the adoption of measures for conserving the supply and disposing of it to the best advantage." Mr. Joseph Parry, the Chief Water Engineer to the Liverpool Corporation, read a paper on "Standard of Purity for Public Water Supplies;" and Mr. C. G. Henzell, Water Engineer to the Leeds Corporation, one on "The Growth of Algæ in Leeds Washburn Water, and Incrustation of Mains."

Some interesting and valuable contributions to the literature of water supply were made at the meeting of the German Association of Gas and Water Engineers in Strassburg towards the end of June. Dr. Gärtner, Professor at Jena, read a paper on "The Present Position of Recent Methods of Sterilizing Water for Drinking Purposes." Other papers were: "The Water Supply of Alsace," by Herr Berger, of Strassburg; "The Geological Structure and Underground Water Conditions of Alsace," by Dr. Feeser, of Strassburg; "The Use of Sulphate of Alumina for Clarifying Water at the Elbe Water-Works of Hamburg," by Herr R. Schröder, of Hamburg; and "Roman Water-Mains," by Dr. Jaenger, of Strassburg. The last-named referred particularly to some clay pipes which had been discovered during rebuilding operations in Strassburg, and to the pipe which had been traced from a spring at Rüttolsheim, about twelve miles distant, to the city. The course lay through hilly country, and displayed great technical knowledge and ability on the part of the Roman engineers responsible for it. The pipes were apparently enclosed in many places in a rectangular culvert, the date of construction of which was believed to be about 200 A.D.

Early in the year, Mr. C. E. Newton read before the Manchester University Engineering Society a paper dealing with the difficulties attending the construction of waterworks. He alluded to the great trouble caused to the Water Committees of Municipalities by reason of vested interests. At the close of the paper some discussion took place on the value of the divining-rod, which Mr. Newton said he had found useful in discovering faults and fissures in the geological structure of the hills banking several reservoirs. An interesting paper, describing the Humphrey pump (to which reference has already been made in connection with the Chingford reservoir), was read before the London and Southern District Junior Gas Association by Mr. H. de P. Birkett, B.Sc. At the meeting of the Royal Sanitary Institute at Plymouth in March, Mr. F. W. Lillicrap, the Water Engineer of the Devonport Corporation, read a paper on the water supply of the borough. At the meeting of the Institute at Chester in the summer, Mr. Joseph Parry, the Water Engineer of the Liverpool Corporation, dealt with the subject of the purification and softening of water. In a paper read before the Institution of Civil Engineers, Mr. Edward Sandeman, who, it may be remembered, was the Engineer of the scheme carried out by the Derwent Valley Water Board, described the method adopted for measuring the flow of the river. Before the same Institution, Mr. W. Carstairs dealt with the yield of catchment areas in Scotland. On the occasion of the congress of the Royal Sanitary Institute in Exeter in the summer, Mr. W. Phelps submitted a paper dealing with water supplies from rivers. He reviewed the conditions obtaining in other countries, and said there was no consensus of opinion in the direction of adopting a general policy of forsaking river supplies, either in this country or abroad. At the meeting of the British Association held in Birmingham in September, Messrs. J. F. Liverseege and A. W. Knapp read a paper on the action of an alkaline natural water on lead.

The use of the divining-rod in connection with water supply has been several times the subject of reference during the year. A Society has been formed in Munich, having Dr. Ing. Robert Weyrauch, the Professor of Hydraulics at the Technical University of Stuttgart, as President, and in a communication to "The Times" he stated that investigations carried out in Germany, especially in Munich, had brought them a good step forward in the elucidation of this interesting and complicated problem. In opposition to Sir William Barrett, they regard the dowsing-rod as a physiological rather than a psychological phenomenon. About the same time, Viscount Dillon furnished to our contemporary what he regarded as "irrefutable evidence" of the value of the divining-rod in finding water for Fort Regent, in Jersey, early in the last century.

Some experiments in divining for water were carried out at Guildford, in the presence of a Committee of investigators constituted under the auspices of the "Sanitary Record and Municipal Engineering." There were three testing-stations —two near the river and one over a low service reservoir. Though the diviners were fairly unanimous in the location of underground water, they held varying opinions as to the depth at which it was to be found and the direction in which it flowed. In the riverside sites, it was stated that there was a practically unlimited supply of water. Most of the experimenters used hazel twigs; but one had an aluminium rod, and two others had provided themselves with clock-springs. In all cases the vibration of the rods when water in any volume was found was very great, and in several instances the hazel twigs broke off. Each of the diviners was accompanied by independent observers. The conclusions arrived at by the Committee were that, whatever sensitiveness to underground water may exist in certain persons, it is not sufficiently definite and trustworthy to be of practical value. Trials were carried out in France with similar unsuccessful results. But the "Sanitary Record" announced some weeks ago that a further trial was to be made if "the champion diviner" would consent to it; and it was to discover the whereabouts of a movable water-pipe which could be placed in any direction under an artificial floor. He would have to decide whether the pipe was full or empty, and, if it was full, which way the water was running. Our contemporary was not sanguine enough to believe that any credit would accrue to those who organized such trials.

In the "JOURNAL" for the 16th inst. we gave a few particulars, supplied to the "Chemical News" by their Paris Correspondent, in regard to some interesting experiments carried out in Tunis in connection with the finding of springs. They were the first really well-conducted experiments made on spring-finders, as well as the first to have given any practical and indisputable results. Some successful experiments in locating hidden pipes were carried out with the "locator" designed by Mr. Edwin Mansfield, of New Brighton, Cheshire.

An interesting announcement was made by the Water Engineer of the Cardiff Corporation (Mr. C. H. Priestley, M.Inst.C.E.) a short time ago that, in conjunction with Professor Parker, he had succeeded, by the use of a solution of common salt, in overcoming the difficulty experienced with regard to the growth of sponge in the pipes in the filtering area at the Llanishen reservoir. Some correspondence has lately taken place in our columns with reference to the corrosion of steel water-mains; and a few remarks in the "Sanitary Record and Municipal Engineering" brought out a number of interesting observations on the use of galvanized iron for water-pipes. The general subject of the corrosion and rusting of iron was dealt with in a paper read before the Society of Engineers by Dr. Eric K. Rideal, M.A., for which he was awarded the President's Gold Medal. An abstract of it was given last week.

PERSONAL MATTERS AND DEATHS.

Before closing this retrospect, a few personal matters which have occurred during the year call for brief notice. Among the official changes, the following have to be recorded: Mr. H. Ashley, M.Inst.C.E., to be Engineer and General Manager of the Portsmouth Water Company;

Mr. R. Bishop, Secretary to the Portsmouth Water Company, in succession to Mr. J. L. Wilkinson, resigned; Mr. C. F. Brown, Water Engineer, Surveyor, and Inspector to the Leiston (Suffolk) Urban District Council; Mr. M. J. Buckley, Borough Surveyor and Water-Works Engineer to the Dublin Corporation; Mr. H. Chambers Bullen, Resident Engineer, Bideford Water-Works extensions; Mr. G. W. Clayton, Water-Works Superintendent to the Blackburn Corporation, in succession to the late Mr. Joseph Wilson; Mr. G. T. Edwards, Water Engineer and Manager to the Leicester Corporation, in succession to Mr. Frederick Griffith, resigned; and Mr. A. Sainty, Works Manager of the Slough Water-Works. Mr. Neville B. Davis relinquished his position as Assistant Water Engineer to the Leicester Corporation; and Mr. Edward Davenport, the Manager of the Ashton (Swineshaw Valley) Works, retired, after about sixty years' connection with the undertaking.

It is gratifying to be able to record several cases of recognition of services, either by increases of salary or by presentations. Among the former may be mentioned Mr. G. Baxter, of Dundee; Mr. F. Hoyle Brunt, Water Engineer and Manager to the Rochdale Corporation; and Mr. J. M. Hamilton, Secretary of the Seville Water Company. Presentations were made to Mr. and Mrs. Roper, on the retirement of the former from the management of the Rickmansworth and Uxbridge Valley Water Company.

Mr. H. O. Stafford Cooke, of the Portsmouth Water Company, was called to the Bar at Gray's Inn; Mr. F. W. M'Cullough, M.Inst.C.E., Chief Engineer to the Belfast City and District Water Commissioners, was placed on the Commission of Peace for Belfast; and Mr. Edward Sandeman, M.Inst.C.E., was appointed Associate Professor of Engineering at Manchester University.

During the year we have unfortunately had to record the removal by death of several gentlemen closely connected with water-works undertakings. They were: Mr. T. Easton Devonshire, the Chairman of the Antwerp Water-Works Company, a Director of the Seville Water Company, and a prominent member of the Institution of Water Engineers; Mr. T. Duncanson, Assistant Water Engineer of the Liverpool Corporation; Alderman Joseph Farncombe, a Director of the Lewes Water Company; Mr. W. Fox, a distinguished Consulting Engineer; Mr. Arthur Graham, Gas and Water Engineer to the Corporation of Mansfield; Viscount Llandaff, who was Chairman of the Royal Commission on the London Water Supply which sat for two years from November, 1897; Mr. C. E. Mauldon, for many years Chairman of the Water Committee of the Sudbury Corporation; Mr. J. Ralston, a member of the Stirling Water Commission; and Mr. C. Wooldridge, the Secretary of the Winchester Water and Gas Company.

THE HUMPHREY GAS-PUMPS AT THE CHINGFORD WATER-WORKS.

Results of the Official Tests.

The number of "Engineering" for the 19th inst. contained details of the official tests of the installation of Humphrey gas-pumps at the Chingford reservoir of the Metropolitan Water Board, carried out under the supervision of the Board's Chief Engineer, Mr. W. B. Bryan, M.Inst.C.E.

In some preliminary remarks our contemporary points out that the tests had to be extended over a considerable period, owing to an insufficiency of water in the River Lea. The consumption tests were made in June last. The contractors had given, under heavy penalties, a guarantee that the fuel consumption should not exceed 1·1 lbs. of anthracite per actual water horse-power-hour; and Mr. Bryan states in his official report to the Water Board that the average fuel consumption of the four large pumps was only 0·931 lb., while the small pump, rated at 20 million gallons a day, gave the very remarkable average figure of 0·8 lb. of anthracite; the general average of the whole range of five pumps being 0·904 lb.

In the same report, Mr. Bryan states that, while each of the large pumps was specified to lift 40 million gallons per day, the actual average discharge was 47·5 million gallons; while the small pump, specified to lift 20 million gallons a day, actually raised 26·1 million gallons. The higher efficiency and relatively larger output of the small pump is, it is stated, mainly attributable to the valve area provided being proportionately greater than it is in the four large pumps. The low consumptions noted above have been realized in spite of the low compression pressure, which was only 20 lbs. per square inch. The maximum pressures attained on the cushion and the explosion strokes were each about 110 lbs. per square inch. The actual efficiency of the pumps referred to in the "air cycle" was 82 per cent., the pumps converting into work 23½ per cent. of the total heat of the gas. The efficiency of the producers was rather over 82 per cent. At the date of Mr. Bryan's report (July 11), the pumps had not, owing to the lack of water in the River Lea, been able to complete the specified endurance test of running each pump continuously for twelve hours per day for seven days. The pumps had, however, already delivered 1750 million gallons into the reservoir; and on the 5th inst. Mr. Bryan announced that the test had been satisfactorily completed.

The results of the tests (six in each case) are summarized in the following table:

Pump No.	1	2	3	4	5
Average duration of tests min.	9·27	8·95	8·37	9·67	10·0
Lift in feet	30·01	30·24	30·06	32·6	30·24
Water pumped galls. per min.	33,407	32,773	33,047	32,663	18,116
Pump H.P. developed	303·9	300·4	301·1	322·7	166·0
Gas used per minute cub. ft.	395·4	393·3	391·5	400·1	191·6
Calorific (lower) value of gas B.Th.U. per cub. ft.	145·7	146·4	146·2	142·2	138·1
Average thermal efficiency p.c.	22·39	22·19	22·33	24·07	26·63
Anthracite used per P.H.P. hour lb.	0·946	0·957	0·949	0·881	0·796

CLEANING PRODUCER GAS WITH SPUN GLASS.

In a paper presented to the American Society of Mechanical Engineers, Mr. H. B. Smith gave an account of a gas-cleaning apparatus in which a diaphragm of spun glass is used as the cleansing medium. The following particulars of the process have appeared in the Engineering Supplement to "The Times."

According to the author's account, the raw gas on leaving the producer is first cooled to a point when the tar vapours are condensed by being passed through a primary cooler or condenser. Thence the gas is conveyed into an ordinary rotary gas-pump, which delivers it through the porous diaphragm, consisting of metal screens enclosing spun glass. The density of the diaphragm can be regulated by the quantity of glass used, and the degree of compression maintained between the metal screens. Ordinarily the diaphragm is made up to a thickness of about ¼ inch; and about 400 cubic feet of gas can be dealt with per hour for each square inch of its area. No tar is retained in the diaphragm—both tar and gas being discharged together. The glass is in the form of ordinary glass wool, which must be distinguished from slag wool, which is impracticable for the purpose.

On the inlet side of the diaphragm, the tar exists in the form of a large number of minute particles, or "tar fog;" but in passing it they coalesce, so that on the discharge side they are of relatively large dimensions—so large, in fact, that they can no longer be carried forward in the gas current, but separate out by gravity and drain into a sump provided for their reception. Good results can be obtained only if the velocity of the gas passing through the diaphragm is high. At low velocities, the gas passes through without apparent alteration; and the degree of effectiveness of cleaning is directly related to the velocity of flow. A difference of pressure of 2½ to 4 lbs. is found to give a degree of cleanness ample for any commercial requirement, and 30 cubic feet of gas cleaned in this way can be passed through a white filter-paper without producing any discoloration.

A plant for dealing with the gas from a producer of approximately 1000 H.P. capacity has been in operation for a year-and-a-half, and another of about 900 H.P. capacity for nearly a year. The largest single installation is designed to clean 200,000 cubic feet of gas an hour, and works in connection with a single producer unit which has an effective grate area of 250 square feet, and is rated to gasify 3000 lbs. of Illinois bituminous coal per hour.

Gas Lighting of Railway Carriages.—As the result of the Aisgill railway accident, the engineers of the Lancashire and Yorkshire Railway have been building carriages embodying many of the recommendations made by Major Pringle in his report on the above-mentioned disaster; and a train of the new carriages was made up on Christmas Eve at Manchester, and dispatched to Southport. Among the special features of the new carriages are the following: The under-frame and bogies are entirely of steel. The gas reservoirs carried on the under-frames are separated from the floor by coverings of steel plates, and are also protected at the ends by steel plates to prevent any possibility of damage. Each gas reservoir is fitted with an automatic valve, and if the gas-pipes are broken this valve closes and instantly prevents the escape of gas.

OUTDOOR LIGHTING IN THE UNITED STATES.

The Committee of the American Commercial Gas Association appointed to consider the subject of outdoor lighting presented their report at the recent meeting of the Association in Philadelphia. It was divided into four sections—viz.: (1) Commercial outdoor lighting; (2) business district improvement lighting; (3) high-pressure lighting; and (4) municipal street lighting. Under the first heading they included sales plans, maintenance, installation, co-operation between manufacturers of lamps and gas companies, lamp efficiency, flat-rate lighting, and outdoor gas lighting in combination companies.

The Committee attempted to set forth the reasons why exterior lighting has not been developed as much in the past as the possibilities warrant, and to point out the methods which must be adopted in order to secure the maximum possible outdoor lighting business. The reasons given for the slow development of this class of lighting in some cities are (1) lack of aggressiveness in soliciting business, (2) lack of forethought, installing the lamps in a temporary manner without any idea of permanently holding the business, and (3) want of efficient maintenance.

The Committee are of the opinion that outdoor store lighting can best be secured and held by selling to the consumer lamps to be paid for in monthly instalments over a period of from one to two years. They have an impression that this plan appeals to the merchant and is best for the gas company, because it develops in the consumer an interest in the lamps through his ownership or part ownership of them; and, as a consequence, he is not so open to the arguments of the salesmen for competing illuminants. It also results in the minimum investment by the gas company and the minimum expense for removals and changes.

The Committee consider that no gas company can successfully hold outdoor lighting business if they are not prepared to maintain the lamps for the consumer; and it is essential that this maintenance should be such that the lamps will be kept continually at their maximum efficiency. It is essential, if outdoor gas lighting business is to be secured and held, that the lamps should be installed in a permanent manner, and of a substantial neat appearance. The Committee show copies of photographs of installations which have been made in the proper manner; and they call attention to the necessity for greater co-operation between the manufacturers of outdoor gas-lamps and gas companies in the development of the units necessary to successfully secure exterior lighting business.

The following are the first and last sections of the report:

Commercial Outdoor Lighting.

Under this heading are placed the lamps installed in front of stores, churches, meeting halls, amusement parks, tennis grounds, signboards, trainsheds, docks, piers, and alleyways. There are manufactured to-day lamps which are capable of doing this class of lighting in a thoroughly practical, efficient, pleasing, and economical manner; and the consensus of opinion among the members of the Committee is that it is one of the most valuable forms of business that gas companies can secure, for it does not displace other forms of gas lighting, but is entirely new business, and is one of the best forms of advertisement for the gas company. The public seldom sees gas-ranges, water-heaters, gas-engines, industrial fuel appliances, or many of the other gas appliances in operation as they pass through the streets; and if they do they have no means of estimating their efficiency. The same is true of residence lighting. Interior store lighting is, however, largely exposed to the view of the general public, and plays an important part in demonstrating the quality and value of our product. But not so much as is the case with outdoor lighting. One can scarcely ride through a city on a fast express train without forming some impression of the local gas service from the observation of the exterior lighting.

It is doubly important that outdoor lamps should be properly maintained; for all that has been said in favour of the outdoor lamp as an advertising medium for gas is reversed where they are neglected or are allowed to get out of order, for they are then a detriment.

Your Committee have spent considerable time and energy in collecting photographs of various installations of outdoor lamps, which they have carefully gone over and discussed as to the good and bad points of such installations, and have sent numerous circular-letters to gas companies throughout the country. The following is an abstract of eighty replies received to letters:

Do not handle outdoor gas-lamps of any kind	12
Instal and maintain outdoor lamps for consumers for a monthly rental	34
Sell outdoor lamps to consumers	26
Companies both selling and renting lamps	8

The following table gives an idea of the monthly charges made by the companies who rent lamps to consumers; the rentals given including maintenance: 1 company furnishes and maintains lamps free; 5 companies rent and maintain lamps at 25 c. per lamp; 2 at 35 c.; 1 at 45 c.; 18 at 50 c.; 4 at 75 c.; and 3 at 100 c. The average rental and maintenance charge is 51 c. per lamp per month, and of this amount approximately 35 c. is credited against the cost of maintenance and 16 c. against the depreciation on the lamp. Sixty-eight of the companies who have made reports to the Committee, supplying a total population of 4,458,000, have in use 9209 outdoor lamps. The average rate for gas is about $1 per 1000 cubic feet, and electricity is sold at an average of approximately 10 c. per kilowatt-hour. In reviewing the reports received, the Committee have formed the opinion that neither the location nor the size of a city nor the cost of gas or electricity has much bearing on the number of lamps that can be put in service.

The best average reported is from a company operating in a small town in New Jersey having a population of about 6500, who have in use 125 outdoor arc lamps. This is not a summer resort town. Comparison between the outdoor lamps in use and the population shows that there are in use an average of 19 outdoor lamps to 1000 inhabitants. If it were possible to secure these results in all the 68 cities previously mentioned as having a population of 4,458,000, the total number of outdoor arc lamps installed would amount to 84,702, compared with 9209 actually reported in service. The second city in point of the number of arc lamps in service compared with the population is a city of 57,000 inhabitants in the extreme South, which has 900 outdoor lamps, or 16 lamps to every 1000 inhabitants. The third best result reported is a city in the extreme North-West, with a population of 82,500, which has in service 988 outdoor arc lamps, or 12 lamps to every 1000 population. A city in the middle South, of 36,000 inhabitants, with 300 lamps in use, or 8 lamps to every 1000 population, stands fourth in the list in results secured. The fifth best report is from a city in the South-West, with a population of over 600,000, having an installation of 2025 outdoor arc lamps in service, or a trifle over 3 lamps per 1000 inhabitants.

The cities referred to above are scattered over a wide range of territory, reaching from the Atlantic to the Pacific coast and from the North to the South. The following table will give some idea of the terms on which the lamps were installed, the maintenance charges, and the comparative price of gas and electricity:

—	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Population	6500	57,000	82,500	36,000	600,000
Outdoor arc lamps	125	900	988	300	2,025
Sell	Yes	No	No	No	No
Rent	Yes	Yes	Free	Yes	Yes
Rental price per month (including maintenance)	50 c.	50 c.	Free	25 c.	$1
Maintenance charge per month for lamps owned by consumer	25 c.	..	..	..	..
Price of gas per 1000 cubic feet	$1	$1·20	$1·15 to 0·60	$1	80c. to 60c.
Price of current per k.w.h.	10 c. to 4 c.	7 c.	6 c. to 2 c.	10 c.	4 c. to 2 c.

It will be seen from these figures that the greatest number of outdoor lamps are not installed where the rate on gas is low and that on electricity high. From the information which has been supplied, the Committee have formed the opinion that a larger number of outdoor arc lamps are installed where electric competition is keen, as greater effort is exerted by the gas company to secure this business as a result of the competition.

Municipal Street Lighting.

Prior to the introduction of the electric arc in 1880, streets were lighted almost exclusively by means of gas-lamps with open-flame burners of from 10 to 20 candle power, used singly or in clusters. This lighting was displaced to a large extent because of the demand for the greater street illumination which was supplied by the electric arc by reason of the higher intensity of the latter.

The introduction of the incandescent gas mantle about sixteen years ago placed the gas company in a much better condition to secure the street lighting business. The old types of lamps used with the open-flame gas-burner were displaced by attractive units, patented and especially designed to produce the highest possible efficiency with the incandescent mantle, with a low consumption of gas.

In order to stimulate and encourage the use of these new units, the companies manufacturing them entered into what was then a new line of business, the sole object of which was contracting for gas street lighting. The extent to which gas is now used for street lighting throughout the United States can be judged from the fact that there are approximately 250,000 of these gas units maintained under contract with municipalities, and sharing with the electric units the appropriations made for the purpose. Each of these lamps, from the gas companies' standpoint, is a desirable consumer of a definite predetermined amount of gas per year, and the time of consumption is largely during the "off peak" periods. The gas for these units is automatically controlled to a definite hourly rate, and the lighting and extinguishing of the lamps is fixed by the lighting schedule conforming to that required by the municipality, of approximately 4000 hours per year.

The gas company receives for gas used for street lighting at the present time, in most instances, the same rate which applies to its smallest consumer; the company is not involved in any contractual relation with the municipality on account of street lighting, and assumes no responsibility other than that of supplying gas to the lamp posts.

The street lighting situation to-day is principally controlled by the electric arc lamps and 60-candle power gas-lamps. The continual extension of electric conduits throughout the residential districts of the larger cities may make the tungsten lamp a serious competitor to be dealt with in the future.

The maintenance charge for gas street-lamps has been steadily

reduced, by means of improved methods of operation and economic devices, to such a point that any further material reduction must be made in the cost of gas to these lamps by the gas companies.

It is a known fact that the efficiency of the incandescent mantle is established, and has not been materially increased within recent years, though, by the introduction of artificial silk, mantles are stronger to-day than formerly, and also possess the desired quality of maintaining a high candle power without deterioration. On the other hand, improvements are being made in the efficiency of electric filament lamps; and a new lamp, having an efficiency of 0·5 watt per candle, will, it is expected, be available in the near future.

To compete successfully with these improvements, it will be necessary to increase materially the efficiency of present gas-lighting units; and as cost is a very essential item in procuring street lighting contracts, increased efficiency will have to be obtained without materially increasing the rate of gas consumption. The only known way by which this can be obtained is by raising the pressure of gas, increasing thereby, with improved units which are available at the present time, the efficiency more than twice that now obtained with low-pressure gas units.

In the efforts to encourage the use of higher candle power low-pressure gas units for street lighting purposes, a fixture consisting of two inverted mantles was designed, which on a consumption of 5½ cubic feet of gas per hour produces 150-candle power. The increased yearly consumption caused by this new unit of 8000 cubic feet, at the current rates for gas, held back most seriously its advancement in the street lighting field, though after several years it has become recognized by some cities, which have seen the advantage of using it in place of the single 60-candle power unit, and have thereby very materially raised the efficiency of the street lighting at an increased cost per unit not much above the actual cost for the larger amount of gas used.

In conclusion, it can be safely asserted: (1) That gas street lighting has increased since the introduction of the incandescent mantle and is now increasing. (2) That electric companies are making every effort to extend their business in street lighting by keeping their prices for current down as low as possible. (3) That gas companies, if they are to be active competitors of electric companies for high candle-power street lighting, must first provide for lower prices for large consumptions, and possibly in the near future for higher gas pressures.

DEVELOPMENT OF INDUSTRIAL FUEL.

The Committee on the Development of Industrial Fuel of the American Commercial Gas Association presented a long report on the subject at the recent annual meeting in Philadelphia. The scope of the report will be gathered from the following abstract, by which it is preceded.

The Committee have endeavoured to indicate the important principles that must be carried out in order to meet with success in the sale of gas for industrial purposes, for to secure this result a definite policy must be established and followed.

Of first importance is the necessity for rendering good service, important not only in the securing of new, but in the retention of old, business. The trend of modern business advancement shows that in all lines the demand is more and more for service; and so industrial gas-fuel business must be conducted from this standpoint, and the demand must be met in this branch of our work, to as great an extent as in any other branch of our business.

Industrial gas service begins when the salesman enters the factory. It means not only the sale of the proper appliance, but its correct installation, its satisfactory demonstration, a guarantee of sufficient gas both in quantity and pressure, and all these backed up with a willingness, coupled with sufficient knowledge, to assist the consumer in overcoming difficulties that may arise in the operation of the appliance.

Your Committee wish to call attention especially to the advantages of co-operation with the manufacturers of industrial appliances. The manufacturer of a particular appliance is, in a sense, a specialist, and therefore has information at his command which can materially assist you in securing business; and this same knowledge can also be helpful to you in giving good service to the consumers whose business you secure.

Industrial gas service means to know the fuel for every heat proposition; and to render industrial gas service means to know and acknowledge that there are different fuels, and that each has its uses and limitations. It is therefore important that you have not only a knowledge of your own product, but also of the competition that you must meet. To render industrial gas service, you must have sufficient knowledge of these competing fuels to enable you to know when and where you can successfully supply your product. There are certain classes of business which rightfully belong to you on the basis of cost or on the quality of the work which city gas can produce.

There are, however, other classes of business, the requirements of which are fully met by competing fuels. We therefore realize that it is important for us to know when this competition is such that we cannot successfully meet it with our product. We have therefore devoted a large portion of the report to pointing out wherein producer gas, fuel, oil, gasoline gas, and electricity are competitors.

Producer gas and fuel oil offer serious competition, as they frequently reach a class of business for which city gas can be used to advantage. Gasoline gas has practically disappeared, on account of the relatively high price gasoline reached during the past two years. Electric heating devices have not affected the gas business seriously up to the present time; and as long as the rates usually in effect remain at their present value, no serious competition will be had from this method of heating.

The sale of gas for industrial purposes is a wholesale business. It cannot, therefore, thrive when throttled with retail rates. While appreciating the fact that wholesale or quantity rates are necessary for the successful development of the industrial gas business, it is also highly important to realize that the question of deciding upon a low point in a rate must be given most careful consideration; and a decision should not be reached, and the rate placed in effect, until all phases of the problem have received due consideration.

The size and number of factories in a locality do not assure, and frequently do not even present, possibilities for the sale of large quantities of city gas at a price that would return a profit to the gas company. The class of business and the fuel purposes to which gas might be applied may be subject to such conditions of service that it would not be profitable to quote a rate that would secure the business.

In the past few years two new and unusual developments have taken place that will, no doubt, prove helpful to the industrial fuel business. One is the proved success of the mechanical apparatus for mixing and burning city gas with oxygen for such operations as lead burning, cast-iron brazing, cutting iron and steel, light welding, and other high-temperature operations. Heretofore this market has been confined to acetylene gas, hydrogen, and Blau gas, in combination with oxygen, and to electricity.

The Committee are unable at the present time to give any definite information regarding the operations in the industrial field where surface combustion can best be applied, since a sufficient number of appliances utilizing this principle of burning gas have not been placed in actual operation to enable one to judge whether all the difficulties, small or large, that arise when new appliances are subjected to actual working conditions are overcome.

The Committee recommend that the following features of the industrial gas business should be given careful consideration, in order that the maximum amount of business in this field may be secured: (1) Wholesale rates commensurate with local operating conditions, and based on careful investigation of the factories in each locality to ascertain the available business. (2) An organization of men trained to secure new business and to retain present business. (3) Co-operation with the manufacturers of industrial appliances. (4) Industrial gas service.

THE MANUFACTURE OF OIL GAS.

The Jones System.

The "American Gas Institute News" for the current month contains in the Educational Department, conducted by Mr. Alfred E. Forstall, the following account of the manufacture of oil gas, in the course of which a description is given of the Jones system, to which reference has already been made in the "JOURNAL."

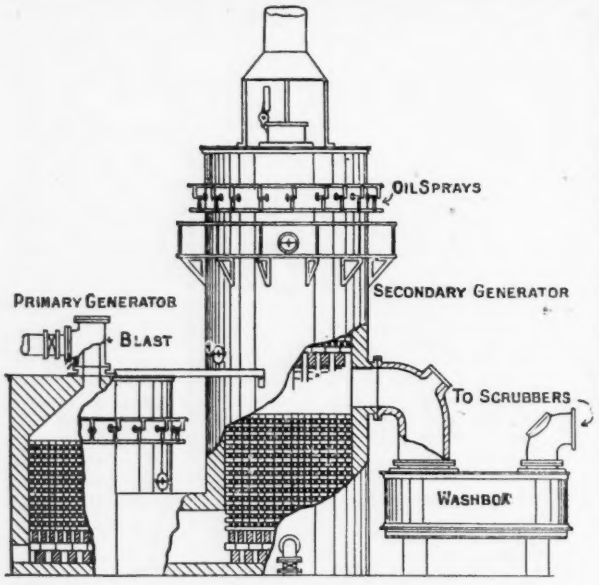
Almost from the beginning of the business of manufacturing illuminating gas there have been used for this purpose hydrocarbon oils, such as Scotch shale oils originally, and later petroleum or some of its distillates, which were distilled in retorts similar to those used for the manufacture of coal gas. After being at first employed as a substitute for, and in competition with, other illuminating gases, this gas for a number of years was used merely for such purposes as the enrichment of coal gas or the lighting of railway cars, and the quantity so used formed only a small proportion of the total amount of illuminating gas made and distributed. During the last years of the Nineteenth Century, the development of large oil-fields caused petroleum to become, in California, the cheapest available source of carbon and hydrocarbons; the carbon contained in both anthracite and bituminous coal being much more expensive there than that contained in crude oil. These conditions led to the development of a process by which there is made from crude petroleum or one of its heavier distillates, as the sole raw material, a gas very similar in its composition to coal gas, but very different from the gas produced by the old method of distilling oil in retorts.

The first plant in which gas of this kind was manufactured was a small one put into use in 1899, while the first installation and use of the process on a large scale were made in Oakland (Cal.) in 1902. Since that time the use of the process has grown steadily, until at the present time practically all the gas made in Arizona, California, and Nevada, and a large part of that produced in New Mexico and Oregon, is manufactured in this way. The original apparatus has been modified from time to time, and there are in use at present three forms of it. One consists of a single shell provided with oil-sprays, or burners, and a blast connection at the bottom and a stack-valve at the top for use in heating-up the set, and with oil-sprays at the top and a gas take-off at the bottom for use when making gas. The travel of the oil put in and the gas

produced during the gas-making time is thus in a direction opposite to that of the oil and products of combustion during the period of heating-up. Each of the other two forms consists of two cylindrical shells of equal diameter but different heights, connected at the bottom by a throat-piece. This and the shells are lined with fire-brick, and the shells are filled to a greater or less extent with chequer-brick similar to that used in the carburettor and superheater of a carburetted water-gas set. The shells range from 4 to 16 feet in outside diameter; and the height of the shorter one varies from 12 to 20 feet, while that of the longer one is from 25 to 40 feet. The difference between the two forms is that in one the gas is taken off at or near the top of the higher shell, while in the other it is taken off at a point not quite half-way up the side of this shell.

The shorter shell is known as the primary generator, and the longer one as the secondary generator. In both types of apparatus, the heat required to gasify the oil is obtained by burning oil introduced in the apparatus through sprays or burners entering the primary generator through the side at a short distance below the top. Oil is sprayed through these so-called burners by means of a small amount of steam, and is consumed by a blast of air introduced at the top of the primary generator. There is a secondary air supply introduced at the bottom of the secondary generator, and the products of combustion pass out through a stack-valve opening at the top of the generator.

When starting-up a cold set, a wood fire is made in the open space in the top of the primary generator above the chequer-brick, and the air blast is turned on; and when the fire is burning brightly, oil is sprayed in through the heating burners. This oil is ignited by the wood fire, and by the time the latter has burned out, the top chequer-brick in the primary generator is sufficiently hot to maintain the combustion, which is continued until the



Jones's Oil-Gas Set.

chequer-bricks in both vessels are at the proper temperature for making gas. When this condition has been reached, the oil is shut off from the heating burners, the blast is stopped, the stack-valve at the top of the secondary generator is closed, and oil turned in at the top of the primary generator and either at the top or the bottom of the secondary generator, according to the type of apparatus, through so-called gas-making burners. The admission of oil at the bottom of the secondary generator is practised with the apparatus from which the gas is taken off at or near the top of the generator, while the admission at the top is practised with the apparatus in which the gas is taken off about half-way up the side of the generator. The run is continued until the temperature of the chequer-brick has been reduced below that at which gas can be economically made, and, as in carburetted water-gas apparatus, the oil is shut off before the end of the run, and the latter portion used to purge the oil gas out of the set by means of steam blown in through the oil-burners.

The take-off pipe, through which the gas passes away from the set, is sealed in a washbox similar to, but larger than, that forming part of a carburetted water-gas set. Because of the large quantity of lampblack which the oil gas contains, the water, instead of entering this box at one point, is brought in through a number of pipes, properly spaced over the area, all of which run nearly to the bottom of the box. By delivering the water in this way, and causing it to overflow from the upper surface, a rapid upward current is produced over the whole area of the box, and the lampblack removed from the gas is carried off through the overflow without being given an opportunity to settle to the bottom and accumulate there. From the washbox the gas, which still contains some lampblack, passes to one or more tower scrubbers, similar to those used in connection with carburetted water-gas sets. It has been found that, in order to effect the complete removal of the lampblack, it is necessary to pass through these scrubbers a large amount of water; the quantity running at some works as high as 45 gallons per 1000 cubic of gas made. Practically the same amount of water is used in the washbox.

After a set is heated-up, the normal operation is to blast for three minutes without putting on any oil, for the purpose of either burning or blowing out lampblack which has been deposited on the brickwork during the run; and then the oil is injected into the top of the primary generator for seven minutes—the total length of the blow being ten minutes. An the end of this time, the oil is shut off from the heating sprays, the stack-valve is closed, and oil is injected through the "make" sprays into both the primary and secondary generators for the first seven minutes of the run, and then shut off and the steam allowed to blow into the generator for three minutes longer, in order to clear out the oil gas.

In addition to blasting without oil for the first three minutes of each blow, it is found necessary to blast without oil for about ten minutes after every ten or eleven runs, in order to keep the chequer-brick free from an accumulation of carbon. After this long blow without oil, heating oil is used for seven minutes as during the regular blows.

The oil is generally preheated to as high a temperature as can be obtained by the use of steam; and the sprayer must be so designed, installed, and adjusted that the oil is projected into the generator in a very finely atomized condition, which may be called an "oil-fog."

In order to understand clearly the reason for the lines along which this process has developed, it is necessary to have a knowledge of the character of, and the effect of heat upon, the hydrocarbon vapours and gases which are initially obtained by the distillation of carbonaceous substances, such as petroleum or its distillates or bituminous coal. These hydrocarbons, as well as those which are present in the gas as it finally leaves the generating apparatus, belong to five groups, each consisting of a number of substances which resemble each other in the relation between the number of atoms of carbon and hydrogen in each molecule, but have varying densities and boiling-points. These groups are the paraffins, the olefines, the acetylenes, the hydrocarbons of the benzene series, and naphthalene.

As far as the hydrocarbons are concerned in the final result, oil gas, as made by the process under consideration, and coal gas consist principally of marsh gas and ethylene, with small amounts of the higher paraffins and higher olefines and of benzene and naphthalene vapour. It is probable, however, that the first products of the action of heat upon either petroleum or coal are largely paraffins of high density and boiling-point, which are either liquids or vapours at ordinary temperatures. Consequently only a small amount of gas would be formed if they were permitted to remain in their original condition. But by further exposure to heat they can be broken-down into simpler hydrocarbons and hydrogen, which are gases, since, when the heavy hydrocarbons are exposed to heat, hydrogen atoms are split off, and hydrocarbons simpler than those acted upon are formed, together with free hydrogen. The final result of the exposure to heat depends upon the character of the hydrocarbons, the intensity of the heat to which they are exposed, and whether this heat acts upon them through radiation or through contact with heated surfaces.

Excessive exposure to heat imparted by contact with highly heated surfaces will result in the formation of a gas consisting almost entirely of hydrogen through which are diffused hydrocarbon vapours, most of which will be condensed into liquids, or in the case of naphthalene into a solid, at the temperatures and pressures frequently met with during the distribution of gas. In addition, such exposure to heat causes the setting free of carbon which tends to produce much trouble in the generating apparatus. The main problem, therefore, in the distillation of any carbonaceous substance for the production of gas is to adjust the conditions under which the secondary reactions occur so as to secure the proper amount of breaking-down of the higher members of the different groups, which are liquids at ordinary temperatures, into the lower members, which are gases, while avoiding as much as possible any breaking-down in excess of this amount, with the consequent formation of an excess of hydrogen in the gas, and an excess of carbon to form a source of trouble in the generating apparatus.

It has been found that heat applied to a complex paraffin by radiation tends to split it up into simpler paraffins and olefines; and if the exposure to such heat is continued for a sufficient length of time at a sufficiently high temperature, the final result is the decomposition of the complex higher members of the paraffin series into methane, the lowest member of this series, which is not affected by radiant heat, and into several of the lower members of the olefine series. On the other hand, heat communicated by contact with hot surfaces tends to produce from a higher paraffin hydrogen and hydrocarbons of the benzene group. In each case the action is accelerated and intensified by an increase in temperature, and is retarded by the presence of an inert gas such as the water gas in the presence of which the oil is gasified during the manufacture of carburetted water gas.

The mixture of methane aad olefines has a larger volume and a higher illuminating value than would be possessed by the original paraffins if they could be kept in the form of vapour, but would be exceeded in both respects by the mixture of hydrogen and benzene vapour if it were possible to produce sufficient hydrogen gas to carry all the benzene vapour without setting free a large amount of

the carbon originally present. This is not possible; and therefore, when gas is to be made from a carbonaceous substance alone, as in the case of the manufacture of oil gas by the process under consideration, or in that of the manufacture of coal gas, and either illuminating or calorific value is of importance, the gas and vapours escaping from the raw material that is being distilled should be exposed to the action of radiant heat at not too high a temperature, but should be protected from contact with highly heated surfaces. If brought into contact with highly heated surfaces, the result will be the production of gas containing a large percentage of hydrogen, combined with the setting-free in the apparatus of a large amount of lampblack, unless the hydrocarbons are protected from too great breaking by being diffused through a gas which will shield them to some extent from the heat.

IMPROVEMENT OF ROAD SURFACES.

The Use of Tar.

In the course of a paper on "The Mechanical Engineering Aspects of Road Construction," read by Colonel R. E. B. CROMPTON before the Institution of Mechanical Engineers on the 18th inst., he made the following remarks on the improvement of road surfaces.

We now come to consider what are the chief features of road design to enable the surface to carry the wheeled traffic of the future at a minimum cost with the least deformation of the surface, and therefore with the greatest comfort to passengers, and at the lowest cost of maintenance of the vehicles that roll over it. The first great change in road construction that has already developed itself to a large extent is that of minimizing the effect of the climate on the road by rendering the road surface impermeable, by dressing it with tar, pitch, bitumen, or other bituminous substances. This tarring of the surface particles holds them together, and prevents their movement when exposed to the comparatively feeble disturbing influence of the rubber tyres of the light class of vehicles. It has enabled roads thus treated to become practically dustless for eight months of the year; but, unfortunately, the action of the tar does not extend sufficiently deep to hold the surface together in winter. It follows that, up to the present, tarring has been efficient only for summer use, and that in most cases one expects to see the tarred surfaces break-up under winter traffic. The author for a long time believed this was solely due to want of strength or mechanical causes; but he now believes it is also due to certain surface-tension properties of the tars used. He has noticed that no such action occurs in the most perfect impermeable and durable surface of all—the asphalt pavement, which stands the effects of traffic of all classes just as well in the wet and cold days of winter as in the dry days of summer.

Up to the present, road engineers have addressed themselves to resisting the surface deformation caused by traffic by using tar, pitch, bitumen, or other waterproof binders to cement together and hold ordinary road stones and similar material by forming it into a partially elastic concrete; these bituminous binders taking the place of the portland cement of hydraulic concrete. Their success has been considerable and progressive, and has been largely due to the employment of machinery to dry, heat, and prepare the material before it is spread and rolled down into place. Mr. Hooley, the County Surveyor of Nottinghamshire, was the pioneer of these methods of deep treatment. He was the first user of blast-furnace slag, which, after being broken to suitable sizes, was tar-treated while still hot, or, if necessary, was reheated, and then dipped into or coated with good tar from the gas-works.

The tarred material was first of all spread and rolled down in successive layers—using the coarser material for the lower coat and the finer material at the top. Many miles of these surfaces have been laid and have been very successful. They have been durable, and in counties near the sources of supply of the slag have been cheap to construct and to maintain. His processes were imitated, but not always with success. It was argued that, if such good results could be obtained with blast-furnace slag, which is a comparatively soft material, even better ones ought to be obtained if high-class granites and basalts were similarly treated. But, from what are now well-understood causes, these expectations have not been fully realized. The tarred slag macadam of Mr. Hooley still holds its own. There have been fewer failures by its use than with any of the other road stones when such previously coated material is used.

A gas-making process has been patented by Mr. G. J. Weber, of Kansas City (Mo.). According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the fuel column in a gas-producer comprises an upper unignited portion and a lower ignited portion burning with a down-draught. Air, or air mixed with steam, is introduced with a whirling motion at the top of the ignited fuel, and the gases pass downwards and outwards through the incandescent fuel in the form of an "annular flaring sheet."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Projected Gas Exhibit at the "White City," 1914.

SIR,—I regret to say that the proposal to organize a Centenary Gas Lighting Exhibit in connection with the Anglo-American Peace Celebration at the White City has not met with sufficient co-operation to justify the South Metropolitan Gas Company in undertaking it.

The idea was so warmly received at the luncheon given on Oct. 22 last to the British Commercial Gas Association, that I cannot think the disfavour with which it is viewed springs altogether from the gas managers' offices. Otherwise it is difficult to understand why the largest London Gas Company is unable to subscribe towards an object which has the hearty approval of the smallest, or why Brighton welcomes what Bournemouth cannot support.

That I am disappointed goes without saying; for I believe that the White City would draw the general public during 1914 to an extent unreached by the recent gas exhibition, and it would have been a magnificent advertisement to have had a hall, from which daylight was excluded, where gas lighting and gas ventilation could have been shown at their best the whole day long by worthy examples of this application to the business and the home.

May I take this opportunity of thanking you for the support which the "JOURNAL" has given to the proposal, and at the same time urge upon all responsible for the conduct of gas undertakings the great importance of their lighting load? For the bulk of the public's requirements, gas has nothing to fear from electricity. I speak from my own experience, for at the house in which I live, I can compare the electric lighting put in by my predecessor with the gas lighting I have installed myself. But the lighting must be well done, and not like some examples which were recently on view, which certainly did not do this important branch of our business the fullest justice.

Dec. 29, 1913. CHARLES CARPENTER.

Interlocking Holder and Other Valves.

SIR,—In view of the unfortunate blunder in closing one valve before another was opened, whereby the supply of gas to a neighbouring town was temporarily cut off, it may be of interest to some of your readers to refer to an attachment I designed for interlocking valves to prevent such occurrences.

After the disastrous explosion at the Saltley Gas-Works in 1904, the Birmingham Gas Committee decided to interlock the inlet-valves of the gasholders at each of their five works; and my attachments were adopted. The attachments are applicable to any type of valve, and are independent of the number and distance apart of the valves. From the time they were installed—more than eight years ago—they have proved to be "fool-proof."

Provided with these attachments, one valve (or a larger number if desired) must always be open; another valve of the series having to be opened before an "open" valve can be closed. When the necessity arises, special keys may be obtained from a glazed case in the meter-house, and the "open" valves closed.

The attachments are also used for interlocking other valves, and are found to be most reliable in connection with town's gas supplies connected to producer plant installations. One supply must be properly turned off before the other can be turned on.

Saltley Gas-Works, Birmingham, Dec. 28, 1913. JAMES HEWETT.

The Leeds Municipal Employees' Strike.

SIR,—The article with respect to the above, in your issue of the 23rd inst., was very interesting; but its logic and effectiveness were completely destroyed by the obvious bias shown in every line.

You apparently begin your investigations by assuming that the men were, of course, wrong. I know nothing whatever about the dispute beyond what I have gleaned from the public Press. But has it never occurred to you that there may be another side to the question? that there was an entire absence of tact, and a very emphatic bumptiousness on both sides prior to the commencement of hostilities—consequently faults on both sides? If so, why attach all the blame to one, and gloat over the information that the men are beaten to their knees.

Many of us who regularly read the "JOURNAL," and value the technical information it contains, are frequently grieved and pained at those petty exhibitions of temper shown towards your pet aversions—viz., trade unions and electricity undertakings.

Saltley, Birmingham, Dec. 24, 1913. (Councillor) JOSEPH GREGORY.

[We are pleased that Mr. Councillor Gregory confesses that he knows nothing whatever about the Leeds dispute beyond what he has gleaned from the public Press, as that takes off the edge of his criticism of our conduct and attempt to look at this ugly business at Leeds not so much from the points of view of men and corporation as from that of the public, whose servants the men were before they attempted to place the citizens, their manufactures, and trade generally, at the mercy of riotous conditions. The "bumptiousness" was certainly very prominent on the side of the men, seeing that they absolutely refused arbitration, or the mediation of Sir George Askwith, and followed up this refusal by violating their agreements and imperilling the city's services. When men decline arbitration, they cannot consider that their case possesses the elements of strength that will win success. If our correspondent is a friend of labour, he had far better keep off the question of the relative degree of "bumptiousness" shown by the parties to the dispute, as we fear that he would fare badly in any

argument on the point. As to the "petty exhibitions of temper" towards our so-called "pet aversions—namely, trade unions and electricity undertakings"—we have before this had our attitude variously described, and one or more additional picturesque descriptions will not harm us. If Mr. Gregory will separate trade union organizations and electricity undertakings from the methods and manners of the conduct of many of them, he will see a distinction; and if he reads what we have to say in the light of that separation, he will find it is not as he supposes that we are against the former, but that we cannot subscribe to the righteousness of all the latter. Moreover, we have a right to express our views upon matters of labour policy, to advance what we consider the highest of all forms of labour policy, and to do our part in keeping up the end of the gas industry against its competitors. Despite Mr. Gregory's opinion that our work in these directions deserves to be characterized as "petty exhibitions of temper," we are afraid our duty calls for its continuance. However, we live in hope of earning the same esteem from Mr. Gregory in respect of these two matters that he possesses for the technical work of the "JOURNAL."—ED J.G.L.]

Pension Schemes for Workmen.

SIR,—With reference to the correspondence which has appeared in your columns on the above subject, will you allow me to say that the distinctive feature in the Tottenham scheme is that it is a "Co-Partners' Pension Fund." No claim was intended to be made in our circular to co-partners for priority for Tottenham in establishing a "Gas Company's Pension Scheme for Workmen."

There are, of course, others beside those of Brentford and the four Companies mentioned by Mr. Cross. The Gaslight and Coke Company have a regular system for workmen's pensions, and the South Metropolitan and the South Suburban Gas Companies have for many years had "Contributory Workmen's Pension Funds."

What was pointed out in the circular was that for the first time co-partnership was being used to assist in the establishment of a contributory scheme to include co-partners of every grade—staff and workmen alike.

I venture to hope that this feature of the Tottenham scheme may be thought worthy of consideration by other co-partnership companies who have not at present any regular system of pensioning their workmen.

E. TOPLEY, Secretary,
Tottenham and Edmonton Gas Company.

Tottenham, Dec. 24, 1913.

A Short Review of Ten Years' Progress.

SIR,—I regret that there are one or two slight errors in the closing paragraphs of my article under the above heading.

The final table of capital, gas sold, &c., in the United Kingdom, although stated as being "Companies," includes "Local Authorities," with their corresponding inclusive data.

In the paragraph following, it is stated that additional business has been obtained with a "capital expenditure" of £622 per million. The term should really be "capital receipts," which include some nominal additions added on conversion.

The figures of capital raised, given as at December, 1912, should be December, 1911—these being in the most recent Board of Trade Returns obtainable.

ENGINEER.

Dec. 24, 1913.

Amusing Sequel to a Coroner's Criticism of Widnes Gas.

On several occasions lately, Mr. S. Brighouse, the Widnes Coroner, has criticized the poor lighting of the Court. About a week ago, this was so bad that he promised on his next visit to bring a couple of good burners. He added that the gas "might well be cheap," and that he would not like to say publicly what he thought about it. At a subsequent meeting of the Town Council, the Coroner's criticism was warmly resented, and it was stated that the poor lighting was not due to the gas, but to antiquated and obsolete fittings. Following upon this the old fittings were removed, and incandescent mantles and globes substituted, so that on his next visit the Court was brilliantly lighted. He congratulated the Court officials on the "wonderful transformation;" and, remembering his criticism of the gas, added, "The least said the soonest mended." Superintendent Foster said he must admit that the fittings were old, but the gas was quite good, after all. At the close of the inquest, Mr. Brighouse requested that all the lights might be put on. Superintendent Foster: "Certainly. I'll show you different gas from what you have ever seen before." The whole of the burners in the Court were lighted; and the Coroner exclaimed: "Ah! that's something like!" The Superintendent rejoined: "It shows you what Widnes gas can do."

Bilston Gas Company.—The profit and loss account of this Company for the year ended the 30th of September shows a credit balance of £12,638, after paying the usual interim dividends. It is proposed to pay further dividends of 5s. 6d. per share on the "A" shares and 4s. per share on the "B" shares—making with the interim dividends paid in July last 11s. and 8s. per share respectively for the year, and leaving a balance of £9953. For some time past the Directors have been desirous of reducing the price of gas to the ordinary consumers for lighting purposes; and they have now decided to make the following reductions as from the Christmas reading of the meters. To the ordinary consumers now paying 2s. 11d. per 1000 cubic feet, the price will be 2s. 9d.; and to those using more than 100,000 cubic feet per quarter, now paying 2s. 8d., the price will be 2s. 6d. The discount of 5 per cent. will be allowed as heretofore, subject to payment on or before the Company's published pay-days.

REGISTER OF PATENTS.

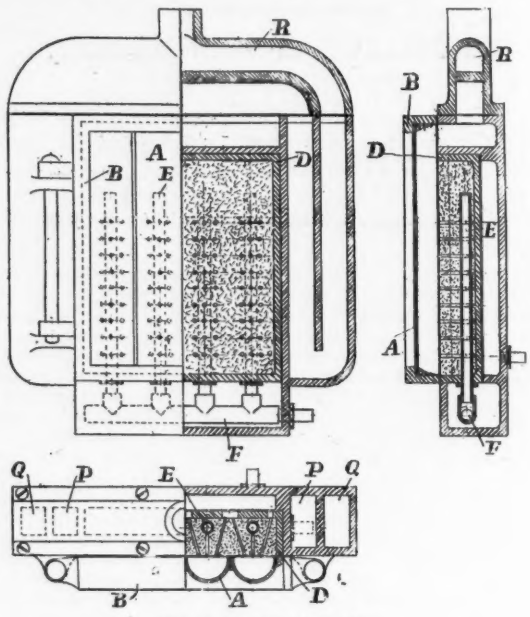
Gas-Fire.

THORP, F. & H. T., of Whitefield, near Manchester.

No. 28,244; Dec. 7, 1912.

This invention relates to the production of a gas-fire for heating rooms "in which the products of combustion are prevented from access to the room and in which under no circumstances can the gas, in case it should enter the room, produce a dangerous mixture."

A front elevation with part section, an end sectional elevation, and a part sectional plan of the gas-fire are given.



Thorp's Enclosed Gas-Fire.

A is one of a series of half-tubes, preferably made of quartz, fixed in a metal frame B which forms the door of the fire. The convex sides of the half-tubes are on the outside and in contact with the atmosphere. D is a cast-iron box fitted behind the half tubes into the main frame C. It contains a series of vertical tubes E arranged so as to be in the central planes of the half-tubes A, and secured in position by non-conducting material, preferably made of fire-clay or other suitable refractory material, packed around them in the box D. F is the gas and air mixture pipe running transversely across the bottom of the fire in an enclosed space provided for it. It supplies gas and air mixture to the tubes E. Through these tubes holes are drilled right through the filling behind, in order to allow jets of flame (when the gas and air mixture is lighted) to impinge on the concave surfaces of the quartz half tubes. Other holes are made through the filling, inclined at an angle towards one another, so that their respective centre lines meet in a common point with the centre of the gas and air mixture jet holes.

The burnt gases are prevented from passing into the room by the joint between the door and the body of the fire and all the other possible exits being sealed by joints of asbestos or other suitable material; and in the case of the half-tubes cement of a refractory nature may be employed. The burnt gases thus having no outlet except that provided in the canopy R necessarily circulate through the conduits P and Q, raising their temperatures and causing them to radiate heat into the room; and the lagging prevents waste of heat by direct conduction from the internal to the external flue.

The patentees mention that their invention refers more particularly to "the production of a high temperature radiation and the being able to expel the products through conduits in which there is a back-pressure." In a totally enclosed gas-fire such as they describe and claim, it is pointed out that ordinary atmospheric burners would not burn efficiently, as the back-pressure in the conduits conveying the hot products away would prevent the gas at the burner nipple injecting sufficient air for complete combustion, and the gas would pass into the room through the air-ports. They therefore use a mixture of gas and air at pressures sufficient to overcome the back-pressures normally produced; and if by any means the back-pressure was increased to such an extent as to prevent the mixture of gas and air properly expelling the products, no gas would enter the room, as the fire is totally enclosed—there is no connection with the outer atmosphere except by the outlet conduits.

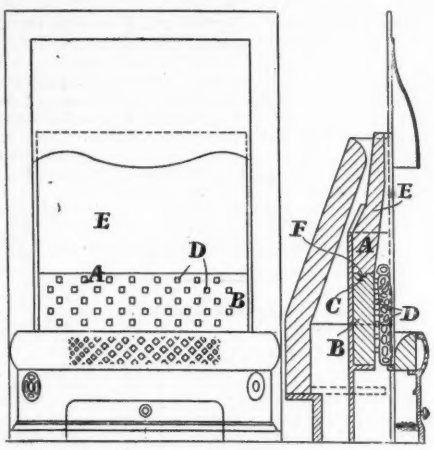
Gas-Fires.

VALENTINE, H. S., of Stirling.

No. 21; Jan. 1, 1913.

Under this invention the back brick or fire back of the stove (formed in parts) is of such dimensions that the top extends up to or about the level of, or somewhat beyond, the lower edge of the canopy or the top of the grate opening—"thereby facilitating the fitting of the back brick or fire back and completely concealing the more or less sooty back of

the existing coal-grate. The extension of the back brick or fire back up to any possible height of canopy also provides the utmost possible radiating surface."



Valentine's Gas-Fire.

Carried into effect in the manner illustrated, the invention comprises a fire back A of refractory material built up in two parts. The lower part B, supported behind the "fuels," has a groove C formed in the top and a number of the usual projections D, to enable air to gain access from between the fuels and the fire back to the flame in the fuels, formed on the face of it. The upper part E extends upwardly to somewhat beyond the level of the bottom of the canopy (or, where there is no canopy, to or about the level of the top of the grate opening) and has a feather F on its base engaging the groove C of the lower part B.

The patentee remarks that, by forming the brick back in two or more parts, the fitting of a standard size of same to an existing grate, having any height of canopy or grate opening, is considerably facilitated, and it is possible to gain access to the space between the body of the gas-fire and the back of the grate for fitting the fire and, if desired, to fill the space with fire-clay for better radiation and increased stability.

Gas-Fired Furnaces.

Cousin, P. A. J., of Loos-lez-Lille, France.

No. 476; Jan. 7, 1913. Convention date, Jan. 9, 1912.

It has already been proposed, the patentee points out, to employ gas-fired furnaces provided at one extremity with burners utilizing producer gas, and upon the sides of the furnace several burners utilizing water gas, in order to operate the furnace in an economical manner—the producer gas being employed for heating the furnace at the commencement of the operations, and the water gas being employed when the furnace has attained a sufficiently high temperature.

The present invention consists, broadly, in the combination of a reducing burner disposed at one of the extremities of the hearth, with oxidizing burners disposed on each side of the hearth. This arrangement, it is said, permits, on the one hand, of easily regulating the nature of the atmosphere created in the furnace—whether oxidizing, reducing, or neutral—by combining appropriately the effects of the different burners; and it also permits, on the other hand, of reducing at will the length of the flame given by the reducing burner, so that it is not longer than the hearth of the furnace, "thereby allowing the furnace to be utilized in the most efficient manner."

The oxidizing burners, by causing eddies in the reducing flame, which is usually long, accelerate the combustion of this flame from point to point, and, in consequence of the shortening of the flame, permit the regulation of their length at will. This reduction of length can be obtained without in any way interfering with the reducing character of the flame, if desired.

In order to obtain the above reduction of length, the oxidizing burners are disposed at the desired height; so that the corresponding flames only produce eddies in the reducing flame and in the upper zone of the furnace which is not in contact with the material to be treated. The resulting flame, although reduced in length, can thus preserve its reducing character, so far as the lower zone is concerned, which is the only one in direct contact with the material being treated, and does not undergo any modification.

The invention also comprises a reducing burner with vertical and parallel conduits for air and gas, separated by a wall which may be easily varied in height in order to vary the height of the point of combustion relatively to the mouth of the hearth. This disposition permits of leading, in all cases, the hottest part of the flame to the desired spot in the length of the hearth, irrespective of the gas used or the conditions under which the furnace is worked. This disposition allows, in addition, of arranging a combustion chamber in front of the hearth, which permits the flame to be ignited without being immediately in contact with the bodies to be heated—thereby diminishing the liability of the flame to be extinguished.

The invention further consists in disposing at the end of a furnace provided with the above improvements, or at any other convenient place, vertical controllable passages for leading away the products of combustion, which products are then led to the chimney by transverse conduits, and thence by a longitudinal conduit—the latter being provided with a partition, in order to render uniform the draught on the two sides of the furnace.

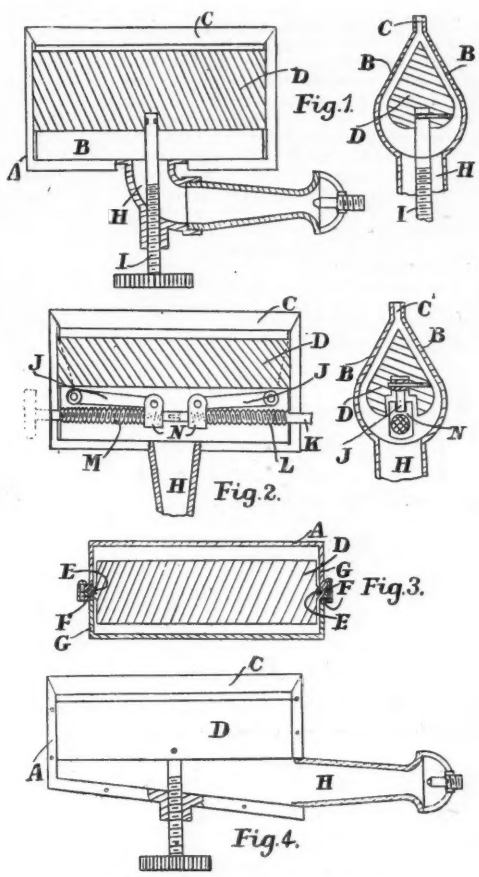
The invention is illustrated by six sheets of drawings, which "show, by way of example, a practical form of a reverberating furnace constructed according to this invention," which may be employed for melting metals – especially as it is of the reverberating type. In such a case, the combination of the two burners is very useful. In instances where the furnace does not work continuously, it is difficult to start it on account of the cooling effect that has occurred, chiefly in the furnace chamber, since the preceding operation (care having been taken, of course, to diminish as much as possible the cooling of the regenerators). In such a case, the present invention enables the furnace to be heated quickly by the oxidizing burner, or by the simultaneous operation of this burner and the reducing burner. The reducing operation is then carried on with the reducing burner alone.

Atmospheric Gas-Burners.

Tooth, L. F., of the Commercial Gas Company, Stepney.

No. 1770; Jan. 22, 1913.

This invention relates more particularly to atmospheric gas-burners for furnaces, and comprises "a construction of burner producing a perfect sheet flame which may be flat or curved, straight, spreading, or concentrating."



Tooth's Atmospheric Gas-Burners.

Fig. 1 shows a longitudinal sectional view and a central vertical section of the burner. Fig. 2 is a modification. Fig. 3 is a horizontal section of fig. 1 showing the manner of guiding the valve. Fig. 4 shows another modified form of burner.

The burner is constructed with a mixing-chamber A formed in halves (as shown), and having its opposite sides B tapering towards a flat nozzle or slit C. Within the chamber is arranged a wedge-shaped valve D; the opposite sides being parallel to the sides B of the chamber. It is formed with V-shaped projections E working within V-shaped guides F on the end G of the chamber A—as shown in fig. 3. In fig. 1, the gaseous mixture enters the chamber through a bent inlet pipe H, and the valve D is adjusted by means of a screw I working through a boss in the inlet. In fig. 2, the gas inlet D is straight, and the valve is adjusted by toggle links J operated by a rod K passing through the end of the chamber A and having oppositely threaded portions L M engaging with nuts N on the ends of the links.

Fig. 4 shows a modified form of burner in which the base of the chamber A is tapered, and the inlet H is arranged in the wall of the chamber so as to produce a flame which projects farther from one end of the nozzle C than the other—*i.e.*, a wedge-shaped flame.

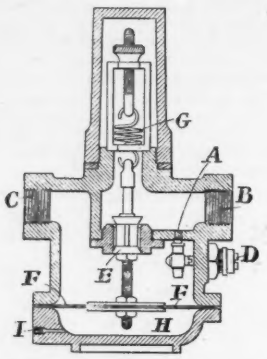
Gas-Pressure Governors.

Stott, J., of Oldham.

No. 488; Jan. 7, 1913.

This governor is of the type where a stop valve is employed for automatically preventing the gas passing to the outlet of the governor when the pressure on the float or diaphragm is suddenly released. Some convenient method is needed in such valves for bringing the governor

into action again when the escape of gas is stopped, or if the gas has been closed off at the service stop-tap and afterwards turned on again.



Stott's Gas-Pressure Governor.

According to this invention, a gas connection A is used for passing gas from the inlet B to the outlet side C of the governor, and to this connection is attached a tap, so placed that it can be operated externally at D without in the slightest degree disturbing the governor. When the stop valve E of the governor closes on its seat through the releasing of the pressure on the diaphragm F (or on the float in the case of a governor of the bell type), and the gas supply to the burners is shut off until the leakage is made good (or if the gas has been shut off at the service tap until the tap is turned on again), the tap on the auxiliary connection A is opened; and this inflates the diaphragm or float, which counterbalances the action of the spring G and brings the governor into action. After this is done, the auxiliary gas supply is shut off by the externally operated tap.

The small chamber H under the diaphragm acts as a cushion, and "is more or less a preventive of oscillation;" and the outlet I allows of a connection to the outside, so that in the event of any gas getting through the diaphragm the escape would be to the open, or "to some position selected as being free from danger in such an event."

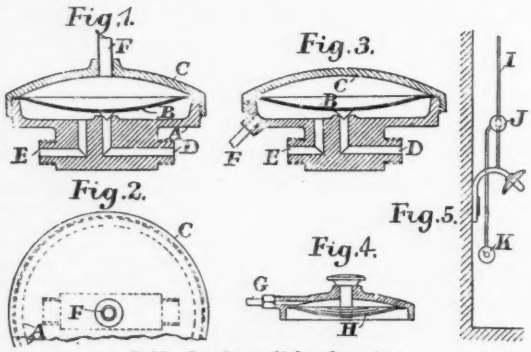
Operating Gas-Valves from a Distance.

REIF, N., of Hanover.

No. 9508; April 22, 1913.

The patentee says that "in connection with gas illumination the use of compressed air or compressed gas for operating gas-valves from a distance has proved itself to be efficient in small installations, but has not secured wide adoption for lighting systems on a larger scale." This is alleged to be due to certain defects of the operating gear; and the object of his invention is to remove these defects.

He proposes to use a concavo-convex elastic diaphragm which is adapted to snap into two alternative end-positions of rest, and divides a valve-chamber into two compartments—one of the latter having an orifice which is closed by a valve connected to the diaphragm, when the latter is in one of its end-positions; and he actuates the diaphragm by means of gas pressure and suction applied to it, for the purpose of moving it from one position to the other.



Reif's Gas-Lamp Valve Operator.

Figs. 1 and 2 show one form of construction—a section of the valve chamber, and a plan of it. Fig. 3 shows another form of construction. Fig. 4 is a section of a so-called switch. Fig. 5 is a diagrammatic view of the general arrangement of valve operating apparatus.

The appliance comprises a cup-shaped part A, on the edge of which a plate spring or elastic diaphragm B is held by a lid C. The spring carries a cone whereby it closes the gas inlet D. E leads to the burner. The diaphragm or spring is concavo-convex; and by virtue of its shape it can snap into either of two end-positions, in which it will remain at rest. One of these positions is that shown in figs. 1 and 3, where the valve is closed; in the other it is open. Joined to the lid C is a suction and pressure conduit F. The apparatus is actuated by the switch shown in fig. 4, which comprises a housing (to which is connected a pipe G), in which is an elastic concavo-convex flexible plate or diaphragm H, making an air-tight joint with the wall of the housing and adapted also to be raised and lowered by a knob and pin, whereby a gaseous fluid in the pipe G is compressed. The pipe G is joined to the pipe F, and the plate H snaps into its raised or lowered position, like the spring B.

By means of the switch air is sucked out of the space above the downwardly curved spring B, so that the pressure on the other side of the spring causes it to bend upwards with a snap, whereby the valve cone is lifted from the orifice of the duct D, and gas passes below the spring and through the duct E to the burner. The spring remains in its raised position of its own accord until bent down again by compressed air, so as to close the duct D, and so extinguish the flame.

In fig. 3 the spring B is bent upwards by compressed gas temporarily admitted through the pipe F below it. For bending the spring downwards again, a considerable volume of gas is suddenly sucked away through the pipe so as temporarily to create a partial vacuum below the spring, and the latter then bends downwards. This arrangement is said to be particularly suitable for controlling the valves of large groups of burners—as for instance with street illumination, when high and low pressure can be produced at the gas-works.

In the general arrangement of the apparatus shown in fig. 5, there is connected to the gas conduit I the valve-box or chamber J (similar to that shown in fig. 1) attached to the controller or switch K, and to the lamp shown.

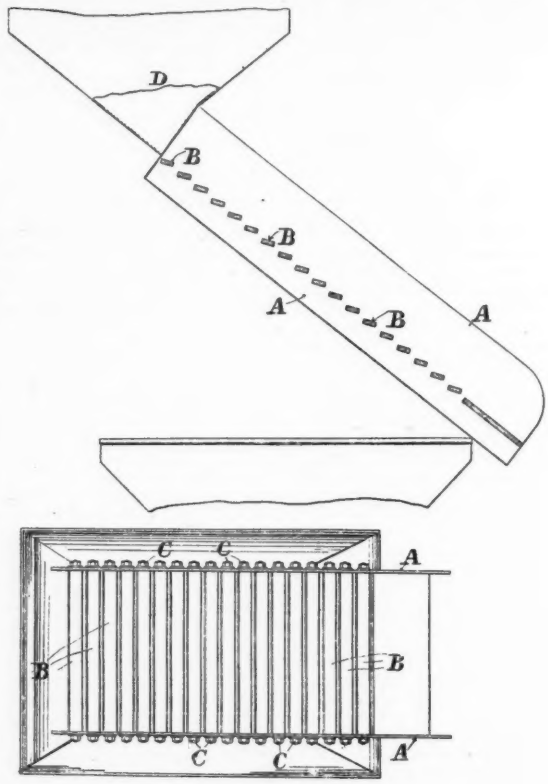
Coke-Screens.

GLASGOW, A. G., of Victoria Street, Westminster.

No. 5342; March 3, 1913.

The patentee remarks that such stationary screens as have been hitherto employed to separate breeze from coke clog up so quickly and leave such a large proportion of the breeze in the coke that rotating, jigging, or other mechanically operated screens are now considered essential in order to secure adequate separation. After continued experiment, he has "invented a stationary screen which causes the material, during its travel by gravity over the screen, to be constantly and vigorously disturbed, so that it rolls and shakes out the small particles and avoids the tendency to jamb-in and clog-up the interstices as is inevitable when coke slides by gravity over the screens hitherto employed."

The screen is formed, as shown, of narrow transverse bars or strips spaced apart and presenting a stepped series of surfaces to the material flowing by gravity across them, which will cause the larger pieces of coke to be continually leaping down from one bar to another throughout the length of the screen without any appreciable sliding over them—thus shaking the breeze particles to the bottom and through the spaces.



Glasgow's Coke-Screen.

The patentee claims to have obtained any desired separation (up to three times the quantity separated out with similar flow when any of the usual longitudinal screens of equal size—whatever the spacing—were substituted for his screen) with a screen under 7 feet long constructed with transverse bars or strips presenting flat upper surfaces about 1 inch to 1½ inches wide with intervening spaces of about 1 inch to 1½ inches wide; the surfaces being inclined at an angle to the horizontal less by (say) 10° to 25° than the general inclination of the screen, which may be about 40° to the horizontal.

The illustration shows as much of the construction of the coke-screen as is necessary to explain the invention—a part longitudinal vertical section and a part plan.

A are the supporting side members of the screen, and B are the narrow transverse bars or strips, spaced apart, and set at the required angle—nuts C on their ends firmly holding them in position. The screen is mounted in such relation to a hopper D that the coke to be screened is delivered on to the upper bar or strip B. The general

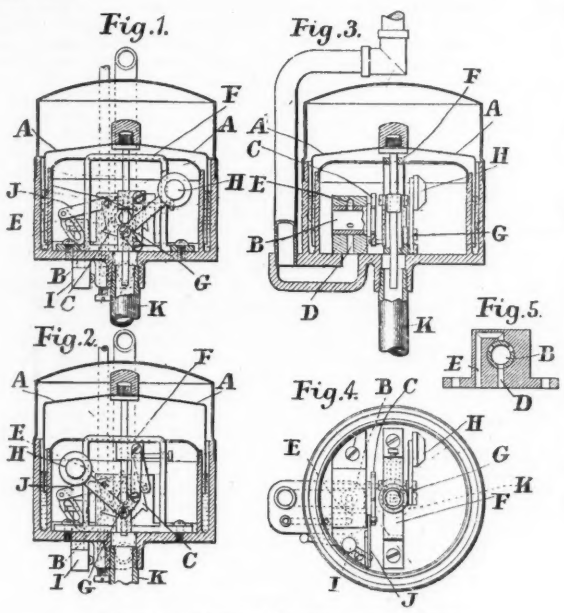
inclination of the screen shown is about 40° to the horizontal, and the upper surfaces of the bars B are at about 15° to the horizontal.

Gas Lighting Apparatus.

FRANCKS, A. H., of Tottenham.

No. 13,452; June 10, 1913.

This invention relates to gas lighting apparatus in which the cock or valve controlling the burners is connected by mechanism with a diaphragm or bell actuated by an increase of pressure in the main to operate the valve; this being assisted in its movement by the use of a tumbler weight or its equivalent, and the lighting being effected by a pilot light.



Franck's Automatic Pressure Lamp Lighter.

Fig. 1 is a sectional elevation with the bell in the "down" position and the mechanism corresponding. Fig. 2 shows the bell "up." Fig. 3 is a sectional elevation at right angles to fig. 1. Fig. 4 is a plan (with the bell and cover removed) in the fig. 1 position. Fig. 5 is a sectional elevation of the casing showing the passages to the burner and bye-pass.

The apparatus is so constructed that a bell A dipping into mercury, glycerine, or some suitable liquid in a circular trough can be employed. Inside is a box or casing containing the valve or cock B (preferably hollow and open at one end and preferably of the three-way kind), the axle of which carries a ratchet wheel C. The casing has a passage D to the burner and another passage E to the bye-pass; so that when the cock is turned on to the burner the bye-pass is cut off, and *vice versâ*.

Across the centre inside is secured a frame forming a bridge F, having holes for receiving a rod carried by, and projecting inside, the bell, and acting as a guide for the up-and-down movement of the bell and rod. On the rod is a block which may have an arm riding in a slot in one wall of the bridge so as to prevent rotary movement of the rod, and on one side of the block is pivoted a swinging link having a tooth or arm which normally has contact with the ratchet wheel on the gas-cock to rotate it.

At some part inside (preferably to a stub on the bridge) is pivoted a bell crank G, and to the short arm is connected a link, which is also connected to the block on the rod of the bell; while the other or longer arm of the bell crank carries a weight H capable of being varied in size or being moved laterally. When the bell is down, both arms of the bell crank lie on the same side of the vertical rod of the bell; but when it is up, the arms on the bell crank lie on opposite sides.

At the side of the valve box is a stuffing box or its equivalent, which carries a stem I having a projecting arm positioned outside the apparatus and another projecting arm inside; the latter arm engaging a slotted link carrying a lever J, the free end of which has a tooth or projecting pin riding over the ratchet wheel of the gas-cock. This pin or tooth acts as a stop pawl for preventing the cock being operated in the reverse direction from any cause, and also as a means for operating it from outside when desired.

The bell is of a weight (or weighted) to suit the normal pressure of the district when in its lowest position, and the gas under normal pressure passes into the appliance without affecting the bell; but when it is desired to operate the cock either to turn on or turn off the gas at the burner, an increase of pressure in the main passing through the pipe K into the appliance will lift the bell, and in so doing the swinging link engages a tooth of the ratchet wheel C and operates the cock while the other link moves the bell crank G and lifts the weight until its arm reaches just beyond the vertical, when the weight falls and assists the bell to rise, and in so doing completes the action of the swinging link on the gas-cock to ensure "perfect complete movement."

On a release of the increased pressure in the main, the weighted bell overcomes the weighted bell crank G and moves it over, when the weight H on the crank, after passing the vertical line, acts to further complete the movement. But in this return motion the swinging link operating the ratchet C has simply passed back to be ready for a fresh operation—the stop pawl preventing any return movement of the cock should there be any tendency for the link to operate it.

MISCELLANEOUS NEWS.

BRIDGE OF ALLAN GAS-WORKS ARBITRATION.

The proceedings commenced (as briefly recorded last week), on Saturday, Dec. 20, in the Caledonian Station Hotel, Edinburgh, in connection with the price to be paid by the Bridge of Allan Town Council to the Gas Company, for the proposed acquisition of the gas undertaking by the Town Council. The sum offered by the Council is £26,685, and the claim by the Company is peculiar, in that it was originally stated at £37,650, but, since the arbitration was decided upon, has been increased to £45,000.

The Arbiter for the Gas Company is Mr. ALEXANDER YUILL, Gas Manager, Dundee, and for the Council Mr. R. COCKBURN MILLAR, C.A., of Edinburgh, with Sheriff JOHN WILSON, K.C., as Oversman. The Counsel for the Company are Mr. F. T. COOPER, K.C., and Mr. J. B. PATON, Advocate, who are instructed by Messrs. A. & J. Jenkins, Solicitors, Stirling, and Messrs. Maxwell, Gill, and Pringle, W.S., of Edinburgh; and on behalf of the Council, Mr. J. AVON CLYDE, K.C., M.P., appeared alone, instructed by Mr. A. Morrison, Solicitor, of Bridge of Allan. The Clerk to the reference is Mr. DOBBIE, Solicitor, of Stirling.

Mr. *Robert Jenkins*, the Secretary of the Company, who was the first witness to give evidence, stated that he had been in his position for over forty years. Formerly the works of the Company were near the station; but these were given up in 1905, when the new works were finished. The new works were built because they were unable to supply the public demand from the old works, which were out of date. He could not say exactly the extended ground offered, near the old works, by Captain Stirling, but it was not suitable for the extension that was desired. He then described the different issues of shares. In February, 1869, the share capital was 896 shares of 50s. each; and it now stood at 3500 shares of 50s. A number of shares had been sold at a price of £6 10s.; and the highest price had been £7 5s. 6d. There had never been any traffic in the Company's shares so far as speculating went; the shares being held as an investment. The Company were approached in 1903 by the Stirling Gas Company, who wanted to buy up the old works. They offered £10,000 of 4 per cent. preference stock, and £10,000 of 5 per cent. stock, or possibly £20,000 of 4 per cent preference stock. For this, they were to obtain all the cash, stock, accounts, and works. These negotiations fell through, because the rumour got abroad, and the Town Council took it up, and the Company had to abandon it. When the present arbitration proceedings started, the Company put in a claim amounting to £37,650. This figure was made up by the Directors, who thought that the shareholders, who had been getting a regular dividend of 6s. per share for many years, were entitled to a capital sum that would yield the same dividend. The 3500 shares were multiplied by £8 per share; and this, together with £9000 borrowed money, made up the £37,000. With some surplus assets, the total was made up to £37,650. At the time the claim was made, no expert advice had been taken as to the amount of the claim. The Directors did it themselves. The result of taking expert advice was that the claim was increased to £45,000.

In cross-examination, it was put to the witness that they had consulted Mr. Yuill regarding the amount of the claim; but witness pointed out that Mr. Yuill had distinctly refused to do this. A further question was raised as to whether the price of £7 5s. 6d. was obtained shortly before the issue of the 825 bonus shares. Mr. Jenkins pointed out that since 1894 the dividend had never been less than 12 per cent.

Mr. *Laurence Pullar*, the Chairman of the Company, said he had held this office since 1883. In 1898, they were hard-pressed at the old works, and requested Mr. Gillespie and Mr. Yuill to advise them as to what they should do. They received from them a joint report on April 7, 1899. It was pointed out to them that the make of gas had increased 28 per cent. during the previous five years; and they were recommended to lose no time in making arrangements for an augmented supply. The Town Council of Bridge of Allan gave them notice that they were going to adopt certain measures to prevent the Stirling Gas Company coming into the town; and this stopped negotiations with that Company. He considered that the new works were constructed on very favourable terms as regarded material and labour. They had kept the price at 3s. 6d. per 1000 cubic feet, and made numerous concessions to consumers in the way of free gas-cookers and other things since the new works were started. The Company had always been regarded as a consumers' Company, in that they did not allow shares to be sold in the open market, but restricted their sale to the consumers. The Directors had never charged any fees for their work. The street lighting was the unprofitable part of the business, as the Town Council were getting more gas than they were paying for. During the thirty years he had acted as Chairman, there had always been a good representation of the Town Council among the Directors. The new works had been constructed on a larger scale than required for immediate use, because they had had experience on laying down works without making any allowance for the future, and were determined to have a modern gas-works, with a margin, in case of accident or anything else, so that the supply of gas could be kept up to the proper point. They were advised that they must have a margin to assure this. He corroborated the evidence of the Secretary regarding the earlier claim, and that no advice was received from experts until the second claim was lodged.

Mr. *John Stuart Gowans*, C.A., a partner of Messrs. A. & J. Robertson, C.A., of Edinburgh, said he had made a minute examination of the books, and prepared a number of statements showing the work of the Company, in some cases from 1866, which was the earliest time that the books were available, though the Company had been formed in 1840. He pointed out that the accounts had not been kept in the statutory form prescribed by the Gas-Works Clauses Act, but like an ordinary commercial undertaking. The actual cash paid into the Company by the shareholders up to the present time had been £11,975 19s. 6d. He had prepared statements showing the original

balance-sheets, and for a period of the last six years had reconstructed these accounts in the statutory form. The statements, in most cases, had been accepted by the Accountant on the other side. He showed the method adopted for writing-off for depreciation and extension of works, for which the premiums on shares had been utilized. In this way, taking the capital value as £19,433 7s. 8d., only £1835 was book value of the old works, of which certain items, in the first year of the reconstructed accounts, had been omitted, because they referred to two payments of the same nature in the one year—namely, the bonus to the Gas Manager and certain rates. The coal values were not exactly in agreement with those of the other side. He had, however, charged to each year the coal used in that year, while the other side had charged the coal invoiced in the year.

A point brought out in cross-examination was the amount of the Manager's salary, allocated to the different items; and Mr. Gowans stated that he had placed five-sixths of this to repairs of works, at the request of the Engineers (Mr. MacPherson, Mr. H. O'Connor, and Mr. J. W. Napier); and it was suggested that the reason for this was to increase the figure for repairs and maintenance.

Mr. *Robertson-Durham*, also a partner in the firm of Messrs. A. & J. Robertson, stated that Mr. Gowans was first instructed in this case on Aug. 30, and he himself on Oct. 22. He had prepared the statements along with his partner. He agreed that the shares sold at £7 5s. 6d, were afterwards allotted the bonus shares. As regarded the items charged to revenue account, but properly chargeable to capital, they had transferred these, after receiving from the Engineers instructions as to their disposal. During the six years, 53 meters had been added to capital account; the balance charged having been for replacement of those worn out. Witness was taken over transactions in shares as shown by the transfer-book, to show the price that the shares had realized, and stated that he found a good many from a price of £6 to £6 19s. A question of the heading under which the manager's and workmen's houses should be placed, and the inclusion of certain items not shown in the statutory form, which was done for the purpose of the valuation by the Engineers, was referred to; and he promised to put in a statement regarding the sum shown for cookers.

THE LEEDS MUNICIPAL EMPLOYEES' STRIKE.

Christmas week began in a disappointing manner at Leeds, so far as the ill-advised strike of municipal employees was concerned. The leaders of the men showed great reluctance to acknowledge defeat; and the authorities very properly maintained a firm attitude. Both sides recognize that Leeds is in the nature of a "test case." If the men could succeed in that city, there is very little doubt that their example would be rapidly followed in many other places; and therefore the Corporation are fighting not only their own battle, but that of other local governing bodies as well.

The negotiations between the Special Committee of the Corporation and the men's representatives, which had been adjourned over the week-end, were continued on Monday, when the two sides met in separate rooms, and a series of communications passed from one to the other, lasting over several hours. No progress, however, was made towards a settlement; and the position at the close was that the strike would have to go on, unless the men accepted the offer of the Committee to make individual application for reinstatement. In their opening statement to the men, the Committee said that, after going carefully into the matter, they could find scarcely a single case in which an employee under the Corporation was not in receipt of a wage which could be favourably compared with similar labour in Leeds or in other towns. In fact it was shown that, out of a total of 2813 men affected in the departments concerned, 2386 were paid higher wages than existed under comparable conditions in the average of the towns quoted by the representatives of the men themselves. "Having regard to the figures now given," the Committee went on, "we desire to say that in our opinion the City Council have fully considered the matters complained of by the municipal workers, and have recommended advances where they thought they were justified, have stated they would consider any cases that had been overlooked, and have offered to submit the whole case to arbitration. The offers of the City Council have been rejected, the men have broken their agreements and left their work, and have dislocated the municipal services to the imminent danger of the citizens. The men may come back on individual application. The municipal services having been so dislocated, employment cannot, at the present time, be found for all the men. All men who can be effectively employed in the departments will be put on at once. Others will be put on as soon as they can be effectively employed. If there are grievances, these will be considered after the men have returned to work."

The men replied asking for a conference, and stating that no settlement could be considered satisfactory which did not provide for a complete reinstatement of all the men. The answer of the Committee to this was that they were prepared to consider any case, or any detail, no matter how small, that might be submitted to them in writing. The men's representatives protested against the attitude taken up by the Committee; and there the negotiations ended.

The statement was made on Tuesday that only a little over a thousand men who were eligible to be taken back remained out on strike; and the great majority of these were unskilled gas-works men. With the exception of some fifty labourers, the water-works men had all gone back. The men at the power station at Crown Point returned to work in practically a solid body; and the majority of the lamplighters had applied for reinstatement. With this rapid crumbling away of their forces, the words of the strike leaders became wilder, and the advice given to the men more dangerous. By this time, great improvement had been made in the gas supply; and full pressure was given at the hours of the day when most generally needed. The Gas Committee publicly announced that they required the services of a large number of stokers and yardmen. The Special Committee also announced that the chief officers of the various departments would proceed to fill up as quickly as possible all vacancies in their staffs, but that they would much prefer that former members of the staffs should apply.

The strike had by Christmas Eve been reduced practically to men of the Gas Department; and even in respect of these a kind of truce was observed—the pickets being withdrawn. Possibly in view of this withdrawal, many of the men took the opportunity of going to the works and signing on for work as soon as it could be found for them. A deputation of six men formerly employed at New Wortley asked for an interview with the Gas Committee, and on being received explained that they represented 400 men who desired to return to work at once. They were told that, in accordance with the notice, individual application for re-instatement must be made; and during the afternoon the 400 men made their applications. The volunteers in the gas and electricity works made the best of their Christmas—cheered by a plentiful supply of the good things of the season. Meanwhile Mr. Wood continued to demand a conference, and declared that the strike must go on. In a letter to the "Yorkshire Post," three lecturers on social questions at the University also urged that a full conference between the representatives of both sides should not be delayed. This letter was sadly mauled by other correspondents, as well as the newspaper itself. It was pointed out that a conference had been offered by the Lord Mayor before the strike; and that, in response to an offer of arbitration, Mr. Wood had replied: "No, we do not want arbitrators. We are our own arbitrators." Many more men on Friday announced their willingness to return to work; but on the following day, it seems, some of those who had signed on were "persuaded" by the strike leaders, or others, not to return to work. The authorities caused it to be announced that, if any damage was done to the house or property of any workman by strikers, in consequence of his returning to work, the damage would be immediately repaired by the city, and if necessary every workman's home would be guarded by police. The men who had signed on were visited and their homes picketed; and certain streets were full of pickets. However, many men eluded those on the watch for them; and on Sunday night it was stated that about 120 of the old hands had got safely into the works. Others, it is more than hinted, have been "terrorized by the Union." "Quite a number of men," we are told, "were escorted to the works by their wives and other female relations, who apparently fail to see why they should continue to suffer in a futile effort to save the face of Mr. Wood."

Announcement was also made of the fact that Meadow Lane would yesterday (Monday) for the first time receive the aid of a powerful ally, in the shape of the new installation of vertical retorts. On Sunday night the strikers met and resolved for a second time not to return to work until an honourable and official settlement has been arrived at. Mr. Will Thorne spoke of increased strike pay, and said that, if the worst came to the worst, it would only be a case of "victory temporarily suspended." This is not the only, or even the most apt, description which might be applied to the strike. The taking on of new men which is now proceeding renders it impossible that every old hand can go back to his former job; and those who find they have sacrificed the substance for the shadow may much better sum up the situation when at last they are disillusioned.

BLACKBURN CORPORATION GAS-WORKERS' PAY.

Amicable Settlement Expected.

As the result of meetings of the various Committees of the Blackburn Corporation, there is every reason to anticipate that the dispute in which the labourers and stokers employed in the gas-works are concerned will be amicably settled.

The application of the men for an advance of wages was again considered by eight of the Corporation Committees on Monday last week. The employees were represented by Mr. J. R. Clynes, M.P., General Secretary of the Lancashire District Division of the Gas Workers' Union, Mr. A. Lees, the Assistant Organizer, and Mr. Fleming Eccles, the Assistant-Secretary; and in almost all cases they appeared before the Committees accompanied by one or two of the affected servants. The whole subject was frankly and freely debated, and eventually the meetings were adjourned for a week. The decision of the Corporation was expected in time to be communicated to a mass meeting of the men in the evening of yesterday. In the meantime, the report of the expert—Mr. John Bond, the Gas Engineer and Manager of the Southport Corporation—who was called in to advise and report on the points at issue [see *ante*, p. 959] will have been received; thus permitting the whole matter to be dealt with simultaneously. In the course of an interview, Mr. Clynes said: "There are indications of feeling on both sides which may enable us to settle matters amicably after we hear the decisions of the various Committees. We felt that, in persuading the men to withhold their notices for a fortnight, we went to a rather unusual length; but the spirit which has prevailed throughout the discussions has already repaid us for the concession we agreed to make to local convenience and comfort." Mr. Clynes repudiated the idea that the holding over of the notices was a sign of weakening, or that the men's position had been "watered down" in any way.

Gas Supply to Walsall Cut Off.—On Friday evening, for a short time, Walsall was without gas, owing, as the Engineer (Mr. B. W. Smith) explained, to a workman having made a mistake which shut off the outlet from the main gasholder. The man, he said, should have opened one valve and shut another; but instead of this, he closed the valve to begin with, and this cut off the gas supply. Immediately the management discovered the error, it was rectified; but, besides the gas in houses going out, nearly the whole of the street-lamps in the town had to be re-lighted. The railway station was also in darkness, but not the signal lights, as these are provided with oil-lamps. Mr. Smith pointed out that every precaution was taken to guard against such an occurrence; but there was always a bare possibility that someone would blunder. Councillor Venables (the Chairman of the Gas Committee) has personally conducted an inquiry into the circumstances, the result of which will be reported to the Committee in due course.

MR. CHARLES CARPENTER, D.Sc., ON CONTENTMENT.

New Year's Address to his Co-Partners.

As usual at the present season, the Chairman of the South Metropolitan Gas Company occupies the opening pages of the "Co-Partnership Journal" with an address to the employees in all grades of service. The subject he chose for this year is "Contentment;" and he deals with it as follows :

I was taken to task the other day for saying there was such a person as a contented workman—and I believe I know many. My critic was probably confusing "dissatisfied" with "discontented," for between these words there is a great deal of difference. The desire for improving one's knowledge and position arises from a feeling of dissatisfaction with the present, which is quite a proper feeling. But for all advancement, whether social or otherwise, time is required ; and between each step towards progress it is well to cultivate a spirit of contentment with all that has already been gained until the time is ripe for another move onwards. Events sometimes happen so slowly that we are frequently unconscious of the change ; but if we look back over a series of years we shall often be surprised how far we have marched ahead.

I was discussing this subject of contentment with the wife of a working man whom I recently met at tea. She was fond of music and pictures, and considered she should have a share in these good things herself. I told her that very few people could keep a private band, but that those who did were generally very good in lending their services for charitable objects, and that anyway the money spent might be put to even worse uses than the encouragement of music. In addition, I expressed the belief that the municipality provided concerts at nominal prices, and that it possessed a very fine art collection which was the property of, and could always be enjoyed by, the citizens. She agreed that was so, but wanted some works of art of her own ; reminding me that Ruskin said we ought to have such things about us in our homes. I replied that she would probably enjoy the greatest amount of happiness by contentment with her present lot while she waited in patience for her future satisfaction.

Now it is the gas consumers who pay our weekly wages bills. A few of these are rich, and if we charged more for our gas they would certainly pay it. But the vast majority of them are poor, who have to look carefully at every sixpence they spend. If we put up the price of gas to pay higher wages, less gas would be burnt, and our business would fall off ; so that in the long run we should have less money to give in wages, instead of more. Increased charges will not help us ; but increased business will do so, as many of our expenses (provision of land, &c.) are stationary ones, and do not grow in the same proportion as our turnover.

We can look forward to those busier times which I hope are in store with the greater satisfaction, because we know that the employees' share in the extra profit earned will not be less than that allocated to the shareholders who have provided the capital necessary to carry on the business.

A large employer of labour in the North was once asked by Sir George Livesey whether a contented worker was not worth 5 per cent. more than a discontented one. "Five per cent.!" was the reply ; "say twenty!" The percentage may be in doubt ; but there is no doubt that we shall carry on our work more efficiently if we have contented labour. Labour, too, will be the better for its contentment. The hours of employment will pass more speedily and happily if a merry heart inspires the daily toil.

That 1914 may bring increasing contentment to all employees is my sincere hope in wishing them

A Happy New Year.

MOSSLEY CORPORATION GAS UNDERTAKING.

Increased Prices Decided Upon.

The Gas Committee of the Mossley Corporation announce an increase in the price of gas. In the course of an article on the subject, the "Oldham Chronicle" last Saturday said the Committee had been the victims of circumstances, and then added : "The Committee met on Monday and considered in full the financial aspect of the gas undertaking. One thing they satisfied themselves upon was that the present position has arisen not from bad or lax management, but through circumstances over which they had no control—to wit, imperative orders from the Local Government Board that a changed policy must be decided upon in regard to the wiping-off of the cost of gas-meters and the like. Gas-meters were formerly the property of the houseowners ; but this system of ownership proved to be so very unsatisfactory that it was decided to make them public property. The life of a meter is certainly more than five years. But this is the period now allowed for repayment, and the whole aspect of the sinking fund has thus been changed. It is satisfactory to know that the expenses in regard to the making of gas remain practically unaltered ; a few pounds cover the difference. To be exact, the cost of the work has only gone up by £5. Against this payments for interest have increased by £471, and for sinking fund by £1937—making a total of £2413. The gas expected to be sent out next year is £990 more than in the current year ; but this is greatly counterbalanced by the reduced prices of residuals. A sum of £868 is put down as the expected reduction under this head ; giving a net gain of £122. Taking this from the £2413, there is left £2291. Last year there was a profit of £724, and this, added to the estimated loss of £1567, makes up the £2291. An increase of 1d. per 1000 cubic feet in the price of gas will yield £625 ; so that the increases decided upon will only enable the Committee to work on a hand-to-mouth policy, and unless the most unexpected should happen there can be no reduction in prices for the next five years at any rate. Gas used for

Gas Heated Hot Water Supply.

"VICTOR" GAS BOILERS.

It is an old saying, but a true one, that "the proof of the pudding is in the eating," and the installation at Messrs. Sandow's Institute of Physical Culture is one of the most convincing examples of the reliability of our appliances. At Sandow's Institute any number of Baths up to 700 are obtainable daily.

Maintenance. Twenty-four Boilers are in use at the Institute, and the cost of parts for renewals in five years has amounted to 9s. 6d. only.

Cleaning. VICTOR Boilers can be cleaned in position without removal. The whole of the Battery at Sandow's has been opened annually for the cleaning of the waterways, while the sweeping of the flues is attended to every six months.

Repeat Orders. Messrs. Sandow have adopted our boilers in two instances since the first installation was fixed in 1907, the most recent being last summer at their Cocoa Works, New Kent Road, in the area of the South Metropolitan Gas Company.

Their Record is acknowledged to be "THE BEST."

APPLIANCES AND SCHEMES PROVIDED TO MEET ANY REQUIREMENTS.

WRITE FOR CATALOGUE.

THOMAS POTTERTON, Balham, LONDON.

lighting purposes is to be put up 2d., and for cooking purposes by 4d. per 1000 cubic feet. The increases come into operation in March next. The prices will then be 3s. in Saddleworth and 2s. 10d. in Mossley. For domestic purposes the prices will be 2s. 6d. and 2s. 4d. respectively."

STOCKTON AND THORNABY GAS SUPPLY.

An Agreement Arrived at.

The conflict which has been proceeding between the two authorities at Stockton and Thornaby, owing to the former charging the consumers in the latter town 2d. per 1000 cubic feet more for gas than the Stockton ratepayers are called upon to pay, has now been amicably settled. It will probably be remembered that the Thornaby Corporation decided to promote a Bill with the idea of obtaining statutory powers to have their own gas-works. The Stockton Corporation determined to oppose the application; and if this had been done it would have meant serious expense to both towns. Now, however, special meetings of both Councils have been held, and an agreement has been come to, the terms of which are as follows: (1) That the gas consumers in Thornaby should be charged from the 31st of March next at the same price and at the same rate of discount as consumers in the borough of Stockton. (2) That for a period of five years from the above-mentioned date the maximum price to be charged in the borough of Thornaby should not exceed 2s. 4d. per 1000 cubic feet net so long as the average price of coal is not more than 14s. 6d. per ton. In the event of the price exceeding this average, power is reserved to the Stockton Corporation to increase the above-mentioned maximum by 1d. per 1000 cubic feet for every shilling or part of a shilling increase per ton in the price of coal. The Corporation of Thornaby agree to withdraw their Bill, and undertake that no Bill for a similar purpose shall be promoted by them until the expiration of the above-mentioned period of five years. The arrangement means a reduction to Thornaby consumers of 4½d. per 1000 cubic feet in the price of gas.

The "Co-Partnership Almanac" for the ensuing year which accompanies the current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company bears upon it the following message of the Directors: "The interest of South Metropolitan Gas co-partners in the business can be expressed on a money basis by the stock they hold, which has a nominal value to-day of £337,410. Large though this sum is, it is outweighed by the worth of their goodwill, which the Directors take this opportunity to acknowledge in wishing them and those they hold dear a Happy New Year." While referring to the almanac, it may be mentioned that the "Journal" itself contains some interesting observations on the origin of the word.

ELECTRICITY AS A BYE-PRODUCT.

At the last Annual General Meeting of the Institution of Municipal Engineers, a paper bearing the above title was submitted by Mr. R. J. Spencer-Phillips.

He said the firm with which he is connected were called upon some time ago to advise the occupants of a certain mill, situated in a country district, as to what they could do to economize their coal consumption. They had at the time three mill engines, and drove by means of ropes and countershafts. There was no municipal supply authority situated conveniently to sell them cheap electricity; and they did not see how they were going to produce current at even as low a cost as 0·5d. per unit when the supply companies were not able to do so and show a satisfactory profit. The author's firm put before them figures taken from the supply stations of which the average load was comparable, as nearly as possible, with the average load of the mill station. The total running cost per unit from existing stations with a 20 per cent. load factor was 0·82d., which was brought up to 1·29d. by the addition of management expenses, interest, and depreciation. The cost per unit for the 700 k.w. mill station, with an 80 per cent. load factor, was: Running cost, 0·278d.; total, 0·364d.—the former figure being about one-third that of the corresponding one for the other station. As regards management, offices, &c., the author pointed out that the mill had a great advantage, inasmuch as no special management was required beyond that which was previously necessary to look after the engineering work.

In arriving at the above totals, the capital outlay was taken as being the same in each instance; but the author said that in the generality of cases the power station would cost considerably more than the mill station, first because a larger plant would be required, and next because, in the case of a mill, use can very often be made of the existing engine-room—thus dispensing with the cost of a new building. The firm in question eventually put down for the owners of the mill a complete turbine-driven plant comparable in every way with an electricity supply station. As a result, the figures given were closely realized, and the coal and repair bills were reduced approximately £4000, which was equivalent to a saving of just over 45 per cent.

The author said the point he wished to make was that the owners found (1) that they could actually produce current at something like 0·35d. per unit; and (2) that there were other mills not far off willing to pay enough for their supply to ensure the owners of the plant a good profit. Therefore, being business men, they were not slow in "putting two and two together," and now, with a slightly larger plant and greater output, they are able to run even more economically, and sell their surplus energy as a bye-product and at a profit.

In conclusion, the author said: Here we have an instance of an already prosperous concern making an additional profit entirely outside its normal line of business. Clearly it would have paid the local authority to erect a power station at one of the mills, having these

CLARK'S Patent SYPHON STOVES

Convincing Testimony.

Dr. Lessing after a 3 months' practical and scientific test states:

"A natural ventilation and even distribution of heat all over the room."

"No deleterious effects from the products of combustion when using the stove in rooms or confined spaces."

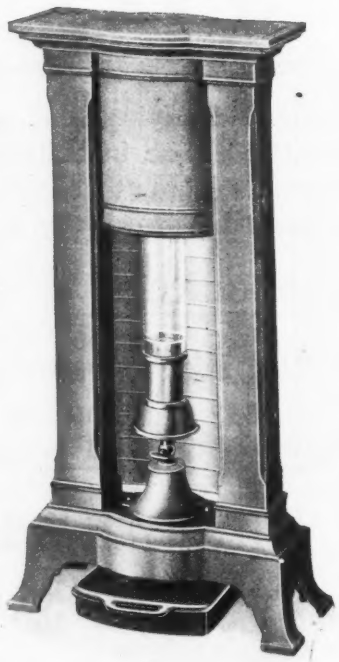
"Your Syphon Stoves can be thoroughly recommended on account of the complete utilization of the gas burnt."

Prompt Delivery.

CLARK'S SYPHON STOVE CO., LD.

Originators and Inventors,

132, Queen Victoria Street, London, E.C.
Factory: Warrington, England.



The PHŒNIX.

mills as its chief source of revenue, and undertaking the local lighting and power supply as an additional source of revenue. Here, then, is a field open for municipal enterprise. In all our towns power loads are eagerly enough sought after, and one can now see why, if terms low enough are not given, the millowners put down their own plant. But there are still cases—perhaps more than one imagines—of smaller towns and villages with mills close by, where there are no electric supply stations nor Provisional Orders granted. Thus, by consulting the millowners first, and perhaps making it a joint concern, a profitable undertaking could be started, and the benefits of electric light and power given to all in the district."

THE PROPOSED TAR AND BENZOL COMMITTEE.

[From the "Iron and Coal Trades Review," Dec. 26.]

Our contemporary, the "JOURNAL OF GAS LIGHTING," commenting upon our suggestions in relation to the formation of a Tar and Benzol Committee, submits that the positions of tar and sulphate are not analogous, and that in consequence any propaganda to assist the former is unnecessary. Our contentions were but slightly directed to propaganda work; but it must be conceded that there is plenty of room for activity in this direction. The use of tar oils in internal-combustion motors, and particularly the use of benzol in similar power generators, calls for it. The Motor Press, for instance, and in particular "The Motor," which prints each week a list of firms supplying motor benzol, and has carried on a campaign for some period directed to securing a greater use of this most efficient combustible, have certainly rendered great assistance to the producers of benzol. Without this unquestionably the growth in the home consumption would have been considerably less. At the same time it is a not uncommon experience that a motor garage which advertises that benzol is stocked frequently has no supply, or fails to supply on one pretext or another.

As regards the use of tar for road spraying, we think our contemporary will admit that prepared qualities—*i.e.*, tars which have been subjected to preliminary treatment to remove the water and the light oils—possess a well-defined superiority over crude untreated tars; and where the producer does not possess the requisite apparatus for distilling off the "first runnings," he is perforce bound to the distiller. Whether there is or is not a ring of distillers hardly concerns us at the moment; but the fact that some firms advertise for tar, making a feature of the statement that they are "outside the ring," certainly does seem significant.

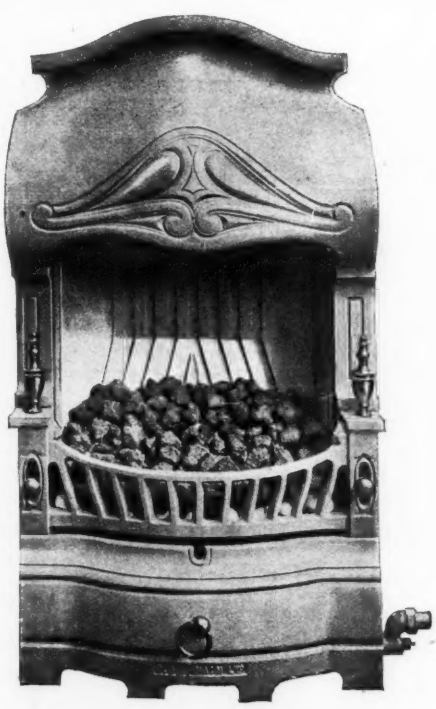
The suggestion that the Sulphate of Ammonia Committee should extend its functions and revenue by taking up the matter seems an excellent one—always providing that a separate Sub-Committee was appointed to deal with the subject. Then the Commercial Sections of the District Gas Associations, as mentioned by our contemporary, could render much assistance to the movement by communicating from time to time to the central body sitting in London a report of the situation in their own districts. So far as our own readers are concerned, the letters we have received indicate a decided leaning towards the suggestion that a Tar and Benzol Committee should be formed; and it is hoped that in course of time sufficient support will be received to justify either collective action or a request to the Sulphate of Ammonia Committee that it should take a hand in the work. We cordially invite our contemporary, the "JOURNAL OF GAS LIGHTING," to assist in the movement.

SMALL ELECTRIC LIGHT AND POWER INSTALLATIONS.

In a recent number of the "Electrical Review," Mr. H. P. Girling had an article on "Small Electric Light and Power Undertakings," in which he gave an account of an installation of plant for the supply of light and power at Burton-on-Humber. The conception and inauguration of this scheme were almost entirely due to Mr. F. Hopper, the founder of the Elswick-Hopper Cycle and Motor Company, Limited; and, according to Mr. Girling, the scheme originated from "the uncompromising attitude of the local Gas Company, and the consequent demand for some other and better form of light to compete with gas." Street lighting was one of the chief troubles, and this was met by an offer from Mr. Hopper to undertake a twelve-years' street lighting contract for 150 electric lamps, each of 100-candle power, at £2 2s. per lamp per annum, from lighting-up time until twelve o'clock midnight during the lighting season. This offer was accepted, and the present Electric Light Company, with a nominal capital of £20,000, was the result.

The plant includes two 70-H.P. anthracite suction-gas plants and engines; the latter fitted with heavy fly-wheels and throttle governors. The dynamos are also arranged with the aid of a double-pole field-breaking switch and three-pole change-over main switch (positive, negative, and equalizing) to start the gas-engines electrically by means of one of the boosters. The mains are of the overhead type, consisting of bare single-strand copper supported in the outlying district on creosoted wooden poles, which have been finished off by having painted battens banded on to them for about 4 feet up. In the better streets, however, painted steel poles, with dwarf bases, have been used for the sake of appearance; and in the leading streets, which are very narrow, underground lead-covered cable has been drawn into earthenware pipes. The street-lamps are controlled in groups by Venner time switches, which are designed to give, when required, morning as well as evening lighting.

Messrs. Biggs, Wall, and Co. have secured a contract for the supply and erection of their patent "Rapid" charging-machine at the Dorchester Gas-Works.



The "St. Felix."

The "St. Felix" Fire has the same unique appearance as the "St. Nicholas," but is self-contained.

Fitted in the same way as the ordinary gas fire with flue, entirely independent of the coal grate.

Artistic and efficient.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

USE OF GAS AND GAS APPLIANCES IN JAPAN.

The number of the "Journal of the Imperial Gas Association of Japan" for the 15th ult. contains an article by Mr. B. S. Inubushi on gas consumption and the use of gas appliances in Japan. The author remarks that though the gas industry has taken a great stride within the past few years, it is an undeniable fact that gas is used mainly for lighting. Even in Tokyo, where the industry is more advanced than in any other part of the empire, and where, with the single exception of Yokohama, it has been longest in existence, the gas used in heating appliances is only in the proportion of about 30 per cent., and that employed for the production of motive power only about 13 per cent. of the total. This is shown by the following figures (the latest available), obtained by the Tokyo Gas Company, Limited:

Year.	Lighting. Cubic Feet.	Heating. Cubic Feet.	Power. Cubic Feet.	Total.* Cubic Feet.
1906 .	442,459,400	72,982,900	144,730,150	731,171,200
1907 .	514,140,100	122,725,100	173,506,400	878,416,850
1908 .	570,561,200	221,102,050	194,532,950	1,074,401,400
1909 .	605,971,500	368,377,580	189,310,350	1,338,305,600
1910 .	614,159,600	510,416,400	199,547,500	1,543,285,600

* Including gas used for other purposes than those specified.

Mr. Inubushi remarks that if such a state of affairs exists in Tokyo, it can easily be imagined that the use of gas appliances other than those for lighting is far more limited in provincial cities and towns. Naturally the gas consumption in Japan in these years cannot compare very favourably with that of Western countries, though he says there are evidences of an increase in the future. In this connection, the following figures may be noted with interest:

Cities.	Approximate Population of the District.	Gas Distributed. (Year 1912.) Cubic Feet.	Approximate Consumption per Head. Cubic Feet.
Tokyo . . .	2,200,000 ..	2,725,494,102 ..	1239
Kyoto. . . .	450,000 ..	140,110,700 ..	311
Osaka . . .	1,200,000 ..	608,153,100 ..	507
Yokohama . .	400,000 ..	177,843,397 ..	445
Kobe	380,000 ..	207,903,650 ..	542
Nagoya . . .	380,000 ..	225,963,600 ..	594
Shizuoka. . .	55,000 ..	15,627,000 ..	257
Okayama . .	100,000 ..	16,251,200 ..	163
Hiroshima . .	280,000 ..	58,621,121 ..	261
Kanazawa . .	100,000 ..	7,806,117 ..	78
Sendai . . .	100,000 ..	16,251,200 ..	163

The population in each city quoted in the foregoing table is merely approximate; so that, while later and more accurate statistics may be obtained, those given will answer the purpose of conveying a general idea. From this table it may readily be seen how small a quantity of gas is used by the people. Mr. Inubushi thinks it becomes a matter of serious moment to attempt a policy for increasing consumption and the use of gas appliances. This, he says, may be more keenly realized when the fact is considered that the greater number of inhabitants throughout the country are not using these appliances, as is virtually shown by the fact that, even in the largest cities, such as Tokyo, Kyoto, and Osaka, only from 50 down to 18 per cent. of the entire number of houses are supplied with gas. In none of the remainder has it yet been laid on.

MOND GAS FOR GAS-WORKS.

The Engineering Correspondent to whose contributions on gas manufacturing topics to the Engineering Supplement of "The Times" several references have been made in the "JOURNAL" had an article last Wednesday on "Mond Gas for Gas-Works." He gave the following as the advantages of this system of gas production in comparison with coal carbonization in vertical retorts: "In the modern type of coke-fired regenerative furnace as used in conjunction with vertical retorts, the heating arrangements have been developed to such a pitch of efficiency that in some cases no more than 10 per cent. of the weight of coal carbonized is required for its distillation. Assuming that this will be a very general figure in the not very distant future, it can be seen that the cost of supplying heat to the retorts amounts to only about 1s. 7d. per ton of coal distilled, allowing a reasonable figure for labour and repairs and a selling price of 13s. for coke. With the Mond plant, on the other hand, coal slack can be obtained some 3s. per ton cheaper than coke; but heavy charges for maintenance, with boiler fuel and labour, bring up the gross cost to the neighbourhood of 2s. 6d. for every ton of coal carbonized. But taking into consideration the sales of recovered sulphate of ammonia, the above charge is reduced by no less than 50 per cent.—making the net cost of heating about 1s. 3d. per ton of coal. Thus, compared with a coke-fired furnace, the Mond plant shows a saving of 4d. per ton on every ton of coal distilled—no inconsiderable sum in large gas-works that deal with something like half-a-million tons of coal a year."

The writer points out, however, that there are other factors to be taken into consideration which do not directly exert their influence on the cost of carbonization. Chief of these is, perhaps, the effect which would be produced on the coke market if the majority of gas companies adopted the Mond gas process. "Even at the present time," he says, "the demand for their coke is anything but brisk, and the general adoption of coal-slack firing would entail the putting on the market of an additional 750,000 tons or so of coke per annum, with the result that the Mond gas economies would soon be negatived. A further drawback to the new system is the comparatively high capital cost, which debars it from use on works except those of the largest dimensions. At present, however, it is too early to form definite opinions as to the merits of the Mond producer for gas-works purposes; and when it is remembered that even with the effective coke-furnaces of the present day only about 54 per cent. of the available heat is made use of it, it will be realized that their is still room for improvement in the prevailing type."

Gas Fire Supremacy.

DAVIS Hygienic Gas Fires are the direct result of concentration on ESSENTIAL DETAILS such as size and shape of flue outlet—Canopy cover of burners—Entire absence of "pockets" from canopy—Height of flue outlet in relation to canopy edge. To scientific accuracy in construction are added Artistic Appearance—Simplicity—Interchangeability—Assured Economy in Gas Consumption. With such a fire GAS is established as the IDEAL FUEL FOR HEATING PURPOSES.

THE DAVIS GAS STOVE CO., LTD.,
59, Queen Victoria Street, London, E.C.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The arbitration between the Bridge of Allan Gas Company and the Town Council has been occupying the attention of a number of engineers interested in gas matters. Mr. Adam MacPherson, Mr. Henry O'Connor, and Mr. J. W. Napier have been examined for the Company, and Mr. W. R. Herring, advising the Town Council, will give evidence later on. Mr. Alex. Wilson, of Glasgow, Mr. Mackay, of Motherwell, Mr. Cowie, of Dalkeith, Mr. Gracie, of Edinburgh, and others have been interested spectators, and have followed the examination and cross-examination of the witnesses. As usual, one side is declaring that the works are excellent in every way, and the other is trying to make the sellers' witnesses agree that they are not. To the onlooker there is much to interest, and sometimes to amuse for a short time; but it becomes tedious when the same points are gone over again and again.

A curious incident has occurred at Leslie, where certain people in the East Prinlaws district desired a supply of gas. An old pipe-track was found, which may be used for the purposes required. It is curious how few gas companies of the smaller size have troubled to keep a record of the size and position of their pipes. It is not to be expected that the manager has the time or ability to make plans or enter the mains properly on the ordnance sheets; but it would not be a costly matter to engage an engineer to do this work, so that a new manager would not, as is frequently the case when he wishes to connect a service, have to open the ground on both sides of the street, and both pavements, before he can find the required main. We have even heard of the tapping of a disused water-main and connecting a service, when, of course, no gas was forthcoming. When such plans exist, it should be the rule to measure the distance of the main from the side of the road, whenever it is laid bare for any purpose, and enter this in the proper place on the plan in red ink. In this way, the exact position will in time be shown for all the pipes, and there will be no difficulty at any time in locating them.

The Dunfermline Gas Department are anxious to make alterations on a building used as a smithy at their gas-works; but objection has been raised, before the Dean of Guild Court, by Mr. W. G. D. Simpson, Solicitor, on behalf of the North British Railway, who claim that the building, as proposed, would be within 4 ft. 6 in. of their nearest rail, which is not in accordance with the Board of Trade regulations as to railways. A further objection was made that one of the walls, on which the building is to be partly erected, is a retaining wall, which is the property of the Railway Company, who had not had time and opportunity to make full inquiries. It was also pointed out that, in the event of the building being completed, the Gas Company's siding could not be worked by the Railway Company. If the facts are as stated, it looks as if the Railway Company had some reason for their objections. The matter has been continued for further inquiries.

It has been pointed out recently that in three or four undertakings in Scotland, over 90 per cent. of the consumers have cookers. This seems a very high figure; but in many houses in Scotland, even where a servant is kept, the predominant "partner" does most of, if not all, the cooking, and in such houses the gas-cooker is very much in evidence as a true saver of expense, and has proved most economical. The Scots have a reputation for carefulness, especially as regards the spending of money. All can remember the anecdote about "Bang went saxpence." Hence the use of the gas-cooker by the Scots woman—and she frequently holds the purse. This is proof of the economy of the gas-cooker, and shows that, properly used, it can be a source of saving. On the other hand, when domestics rule the kitchen, the burners are frequently left turned on long after they are required, and gas-cookers prove very expensive. The handiness of the gas-cooker is quickly found out and appreciated by the paid cook, and it is frequently used for boiling and baking, while the kitchen fire is kept in and is roaring up the chimney. Thus the gas bill and the coal bill are both kept high, and the unfortunate householder pays double for the cooking of his food. An opportunity occurred recently to make a test of this, when a house which was fitted with electric light, and gas only used for cooking, was taken for a month or two. This was in the autumn; and while the electric light bill was nearly double the ordinary gas lighting account for a similar period, the coal bill was more than usual, and the gas bill over £2 for the period of only five weeks during which the test was instituted. In fact, it was found that the expense of lighting, heating, and cooking, as carried on by the careless maids there employed, was nearly double what is usual with gas for lighting and coal for heating and cooking. This showed clearly how, in some cases, the installation of a gas-cooker may be attended with a heavy increase in expenditure, unless every care is taken to ensure economy. Show-room attendants should call customers' attention to this possible cause of objection to gas-cookers, and warn them to exercise due supervision over the domestics if they would get good efficiency with little cost.

Gas Explosion at Walsall.—Following an escape of gas in the front sitting-room of a house at Walsall, there was an explosion last Saturday week, by which a Miss M'Nally was somewhat severely burned. Neighbours assisted her to the hospital, where she was detained. A good deal of damage was also done to the house.

British Coalite, Limited.—The loss entailed on the operations of this Company for the twelve months ended the 30th of September amounts to £11,627, in comparison with £11,192 for the previous year. This sum, however, includes a reserve of £4060 for Directors' fees, together with charges for interest on loans and debentures, fees of Trustees, and premium on redemption of debentures (of which £15,000 have been redeemed during the year), amounting to £5678. Apart from these items, the net loss for the year is £1889. A scheme for the reorganization of the Company has been prepared by the Directors [see *ante*, p. 365], and is now awaiting the sanction of the Court.

THE

Ventilating Radiator.

Richmond's Ventilating Gas-Steam Radiators should be fitted in all Workshops, Factories and other places coming directly under the jurisdiction of the Home Office. It conveys products through the flue to the outside atmosphere. Where the ordinary flueless radiator cannot be fixed we recommend this system.

When considering the next installation for Factories, Workshops, &c., write us.

Full particulars and lists on application.

THE RICHMOND GAS STOVE AND METER COMPANY LIMITED

132, Queen Victoria Street, London, E.C.

Works: Warrington, England.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 23.

Sulphate of Ammonia.

Since the end of last week there has not been any change in either the tone or the value of this article in any position. Quotations for near delivery are maintained at £12 16s. 3d. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith; while for January-April shipment, in equal monthly quantities, a premium of 2s. 6d. to 5s. per ton on these prices is required by manufacturers.

Nitrate of Soda.

The market for this material also remains without alteration, and to-day's values are 10s. 6d. per cwt. for ordinary quality and 10s. 9d. for refined, on spot.

LONDON, *Dec.* 23.

Tar Products.

There is no alteration in the prices for tar products, and business, on the whole, is somewhat quiet; but, of course, this is not unexpected at this time of the year. There has been very little business doing during the last few days in pitch; but buyers abroad report that they have been offered the article at slightly lower values. Benzols remain steady; but consumers abroad will not pay the figure being asked on this side. Solvent and heavy naphthas are quiet, and contracts are difficult to arrange. There is nothing new to report concerning crude carbolic. Makers will not sell at the present prices. Creosote is fairly firm and maintains its quotation.

The average values during the week were: Tar, 27s. 6d. to 31s. 6d. Pitch, London, 40s. to 40s. 6d.; east coast, 39s. to 40s.; west coast, Manchester, 39s. to 40s.; Liverpool, 39s. 6d. to 40s. 6d.; Clyde, 39s. to 40s. Benzol, 90 per cent., naked, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 1s.; North, 11d. Toluol, naked, London, 10½d. to 11d.; North, 10¾d. to 11d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 10½d. to 10⅝d.; North, 9½d. to 9⅝d. f.o.b. Heavy naphtha, naked, London, 10d. to 10½d. f.o.b.; North, 9d. to 9½d. f.o.b. Creosote, in bulk, London, 3⅝d. to 3⅞d.; North, 3d. to 3⅛d. Heavy oils, in bulk, London, 3¾d. to 3⅞d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 1d. to 1s. 1⅛d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit; "B" quality, nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

A very quiet market has been experienced during the past few days, and orders have been taken abroad for the forward position at prices which work out lower than those quoted by manufacturers on this side. Evidently the majority of dealers do not think much of the market. Outside London makes to-day are quoted at £12 2s. 6d.; Hull, £12 16s. 3d. to £12 17s. 6d.; Liverpool, £12 17s. 6d.; Leith, £12 18s. 9d. to £13; Middlesbrough, £12 17s. 6d.

COAL TRADE REPORTS.

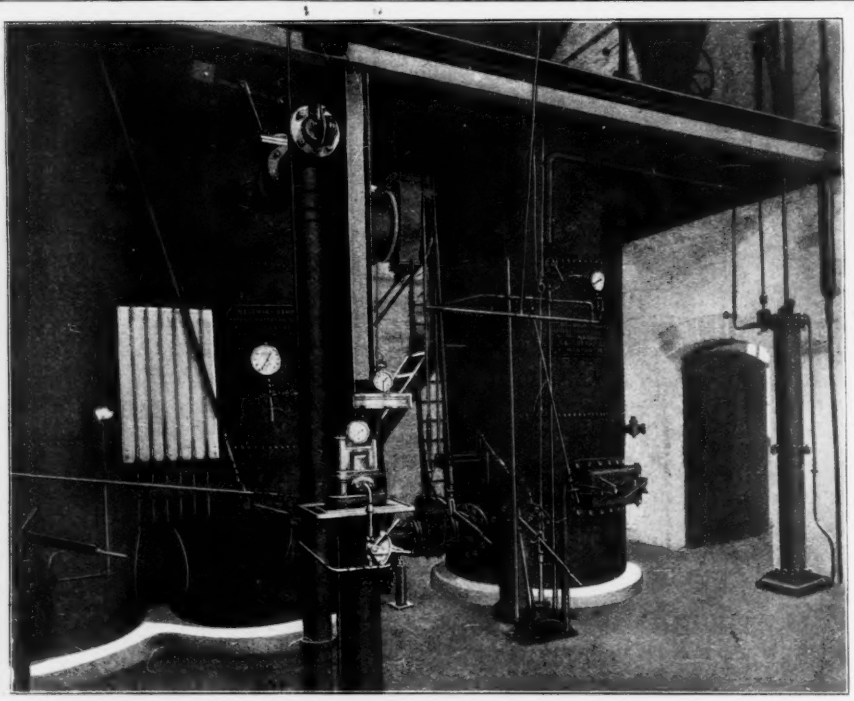
Northern Coal Trade.

The coal trade was brisk in the early days of the week; but the holidays have checked production until the turn of the year, though a little coal will be shipped. In steam coals, best Northumbrians are quoted from 14s. 10d. to 15s. 3d. per ton f.o.b.; second-class steams are 13s. 3d. per ton; and steam smalls are in good supply at 6s 3d. to 8s. 6d.; but there is the irregularity usually known at this time of limited production. There have been heavy shipments of gas coals during the last few days, as the output was full up to the holiday beginning, and steamers had arrived more rapidly. Prices do not show much change. The best Durham gas coals are quoted for early delivery from 15s. 4½d. to 15s. 6d. per ton f.o.b.; second-class kinds are 13s. 5d. to 14s.; and "Wear" specials are about 15s. 9d. to 16s. There is, however, little gas coal for early sale, so that it will be a few days before anything like settled quotations can be given for coals for next year's delivery; and there is now some disposition to wait before sale. In the meantime, there have been some portions of the Paris gas coal contracts allotted to Durham collieries; but the details are not disclosed, though it is believed that a considerable quantity of second-class Durhams has been sold at a price estimated at near 12s. 4d. per ton f.o.b. Coke is firm. Gas coke is plentiful; and the price is from 16s. to 17s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

On account of the holidays, business was practically suspended on the Glasgow Coal Exchange.

Supposed Gas Poisoning in Dublin.—Considerable mystery surrounds the deaths of Mrs. Jane Westgate, a widow, aged 60, and her daughter, Mrs. Ann Craig, aged 40, whose bodies were discovered on Christmas Eve in the room in which they lived at the Iveagh Trust Buildings, Bride Street, Dublin. The younger woman's husband, a sailor, was not at home, and the two lived very quiet lives. A porter connected with the buildings, receiving no answer to repeated knocks on the day mentioned, had the door opened, and discovered the women lying dead one beside the other, on a bed. The bodies having been removed to the Meath Hospital, the House Surgeon there declared that the elder woman had been dead for 24 hours, and the younger one for about five hours. Though the cause of death could not be definitely stated, the surmise was that escaping gas had led to asphyxiation. For some days before the 24th inst., the dwellers in the Iveagh Buildings had been complaining of an escape of gas. The pipe from the street was accordingly examined by a mechanic in the service of the Gas Company, who found that there was a leakage; but, so far, it is not known if the gas ascended through the house to the place where the women slept. Dr. L. A. Byrne, the City Coroner, opened an inquest last Saturday evening, but adjourned it until the 6th prox., on the ground that it would be necessary to have the blood examined, in view of the suggestion as to gas poisoning.



DEMPSTER'S BLUE AND CARBURETTED WATER-GAS PLANTS

for

EFFICIENT and ECONOMIC WORKING.

For Particulars apply to:

R. & J. DEMPSTER, Ltd.,

Tel. Address "SCRUBBER, MANCHESTER."

Gas Plant Works, MANCHESTER.

Court of Justice in Darkness.—During the trial of a prisoner in the High Court of Justiciary in Glasgow, the electric lights suddenly went out, and the Court was in darkness. After some coaxing, the current returned, but only to fail again; and after a further repetition of the annoyance, the trial had to be adjourned. The occurrence is stated to have created something of a sensation. Perhaps those present had been accustomed to gas.

Montreal without Water.—According to a telegram which reached London through Reuter's Agency, Montreal was suffering from a water famine last Friday, owing to the collapse of an intake-pipe in the municipal water-works plant. The hospitals were compelled to purchase aërated water by the ton; while the poor were using melted snow. It was stated that the normal water supply would not be restored for at least a week. Meantime tubs were being placed in the streets in the crowded sections of the city.

Gas Explosion at Luton.—A gas explosion, which caused injury to four persons, occurred on the evening of Christmas Day at the residence of Mr. William Bunyan, in Wellington Street, Luton. Gas which it was stated had escaped from the main had accumulated under the boards of the front-parlour of the house, and when the ordinary jets were lighted an explosion occurred which practically wrecked the room, and did considerable damage to other parts of the house. The occupants of the apartment were dazed and sustained bruises, but no serious damage.

Portsmouth Corporation and their Gas Supply.—A Special Sub-Committee appointed by the Finance Committee of the Portsmouth Town Council have commenced inquiries relative to the proposal to municipalize the Portsea Island gas supply; but the general feeling is that the suggestion will not be realized, owing to the probable extent of the purchase price involved, and the compensation that would be required on the Directors' and shareholders' rights. It has been decided, however, that the Committee shall make inquiries of other municipalities who are running gas and electricity side by side.

Electric Light Failure at Enfield.—The electric supply failed in Enfield shortly before 7.30 p.m. on the evening of the 22nd inst.; the tram service being stopped and shops placed in darkness for some five minutes. The local Carnegie Library, having evidently anticipated such a failure, promptly brought into use a number of candles.

Theft of Piping from the South Metropolitan Gas Company.—At the Tower Bridge Police Court on Monday last week, John Boston, fitter, Henry Parry, labourer, and Thomas Frederick Dunn, assistant storesman, were charged with stealing and receiving three pigs of lead, of the value of £1 12s. 3d., the property of the South Metropolitan Gas Company. Herbert Inwood Robinson, a fitter, was also charged, in conjunction with Dunn, with stealing and receiving 60 feet of iron pipe, value 7s. 8d., the property of the Company. All four men have been in the service of the Company for a number of years. Mr. Pasmore (Messrs. Hicklin, Washington, and Pasmore) prosecuted. It was stated that there had been extensive losses from the works in the Old Kent Road, particularly during the weeks when Dunn was assistant in the stores on night duty. In consequence of this, Gilbert Schofield, an assistant in the stores, was set to keep watch; and he stated that he saw Boston and Parry receive from Dunn three pigs of lead, which were placed in Boston's truck, the cover of which was locked, while Robinson also received some piping which he placed on his barrow. A detective followed Boston and Parry next day, and saw them take pigs of lead to a metal dealer at Peckham, and the witness Schofield followed Robinson to a house in Hyndman Place, Old Kent Road, where the piping was found. All the men pleaded guilty after their arrest. Mr. Pasmore asked for a remand in the case of Boston, Parry, and Dunn, in the hope that the missing property might be traced. Robinson's story that he was going to do some work for a mate, who was innocent in the matter, had been found to be true. The Company behaved most admirably to their employees; and after having given their men every consideration, and trusted them, they felt they could not pass over a betrayal of trust. Robinson was sentenced to six weeks' hard labour, and the other men were remanded.

GAS COMPANIES' STOCK AND SHARE LIST.

Christmas week was little more than half-a-week on the Stock Exchange; for, after two closed days on Thursday and Friday, the re-opening for Saturday was not regarded with general favour, and several members were conspicuous by their absence, while, of those who did attend, many quitted early. The week's business was thus inevitably on a very reduced scale; but markets for the most part presented the welcome feature of a marked recovery from the depression amid which the foregoing week had closed. This was most apparent in Consols, which actually rose ⅞ in three days. This cheering phenomenon did good in other quarters; several markets gathering strength and closing firm. The tendency at the opening on Monday was quite promising, and Government issues at once began to show their quality; Consols rising ⅛. Rails were steady and unmoved; but Transatlantics were heavily sold by the Continent. Of these, American effected a slight recovery. There was no feature in the Foreign Market. Tuesday's business was quiet, but developed a strong improvement in tone affecting all departments. Government issues started it, led by Consols, which (for various sufficient reasons) had a rise of ⅝. The favourable tendency spread itself. Rails scored several moderate advances in price; and even the unhappy Transatlantics rose a little when recent sellers came to buy back. On Wednesday business grew quieter and quieter, but still the tendency was quite favourable. Consols continued their triumphal march upwards, changing hands at 72¼ and advancing ⅛ in quotation. Rails followed suit, and most issues advanced; but Transatlantics gave way. Saturday was as nearly a *dies non* as could be; but the good tone of the markets suffered no depression. Consols were steady without further change, and closed at 71⅞ to 72⅛—a rise of ¼ in the week. Rails and the Foreign Market showed strength, and Americans were fair. In the Money Market the demand was steady and rates were firm; but discount terms were tending towards greater ease. Business in the Gas Market was at a very low ebb, even after allowance be made for the compulsory holiday inaction. Prices showed no change; and there was no salient feature to chronicle. In Gaslight and Coke issues, the ordinary was done at 101¼ to 101⅞. In the secured issues, the maximum changed hands at 75¼ to 75⅝, the preference at 95¼, and the debenture at 72¼. Three dealings were the sum total in South Metropolitan, at 109 and 110; and the debenture marked 73½. In Commercials, the 4 per cent. realized 106½ and 107½, the 3½ per cent. 103, and the debenture 70½. Among the Suburban and Provincial group, British was done at 45½, Bournemouth "B" at 14⅞ and 15, and Lea Bridge at 120. In the Continental companies, Imperial was marked at 168¾ (only one transaction), and European at 17⅛ and 17¼. Among the undertakings of the remoter world, Primitiva realized 5¾, ditto preference 4⅞ to 5, and San Paulo preference 11.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	58–61	..	6 11 2
374,000	,,	July 11	4	Do. 4 p.c. Deb.	80–83	..	4 16 5
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6¼	..	5 15 5
50,000	10	Aug. 28	15	Bourne- 10 p.c.	28½–29½	..	5 2 2
347,500	10	,,	7	mouth Gas B 7 p.c.	14⅞–15⅞	..	4 11 10
75,000	10	,,	6	and Water Pref. 6 p.c.	13½–13⅞	..	4 7 3
380,000	Stk.	Aug. 14	14	Brentford Consolidated	262–267	..	5 4 10
330,000	,,	,,	11	Do. New	203–203	..	5 5 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	111–113	..	4 8 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	91–93*	..	4 6 0
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201–206	..	5 6 10
244,200	,,	,,	8	Do. A Ord. Stk.	149–152	..	5 5 3
530,000	20	Sept. 26	12½	British	44½–45½	..	5 9 11
120,000	Stk.	June 27	4	Do. 4 p.c. Deb. Stk.	87–89	..	4 9 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91–93	..	4 6 0
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2¾–4¼	..	—
100,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	75–80	..	5 12 6
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.	103–111	..	4 10 1
1,513,280	Stk.	Aug. 28	5⅓ 4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	6⅓	Do. 3½ p.c. do.	102½–104½	..	5 2 0
475,000	,,	Dec. 11	8	Do. 3 p.c. Deb. Stk.	70–72*	..	4 3 4
800,000	Stk.	,,	4½	Continental Union, Ltd.	79–82*	..	5 9 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	120–122*	–1	5 14 9
492,270	Stk.	—	1⅔	Derby Con. Stk.	123–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	July 30	10	European, Ltd.	17–18	..	5 11 1
15,386,660	Stk.	Aug. 14	1/17/4	Gas- 4 p.c. Ord.	101–103	..	4 14 7
2,600,000	,,	,,	3½	light 3½ p.c. max.	74–77	..	4 10 11
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	93–96	..	4 3 4
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	71–73*	..	4 2 2
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	88–90	..	5 11 1
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅜–17⅛	..	6 7 6
181,000	Stk.	Sept. 11	7⅝	Ilford A and C	150–153	..	4 19 8
65,780	,,	,,	6½	Do. B	118–120	..	5 2 1
65,500	,,	June 27	4	Do. 4 p.c. Deb.	89–91	..	4 7 11
4,940,000	Stk.	Nov. 13	9	Imperial Continental	167–172	..	5 4 8
1,285,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	83½–85½	..	4 1 10
200,342	Stk.	Aug. 28	6½	Lea Bridge Ord. 5 p.c.	115–121	..	5 3 4
561,000	Stk.	,,	10	Liverpool United A	210–212	..	4 14 4
718,100	,,	,,	7	Do. B	146–148	..	4 14 7
306,083	,,	June 27	4	Do. Deb. Stk.	95–97	..	4 2 6
63,480	Stk.	June 27	3	Maidstone 3 p.c. Deb.	66½–68½	..	4 7 7
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅜–4⅝*	..	6 3 1
250,000	100	Oct. 1	4½	Met. of Melbourne 4½ p.c. Deb.	97–99	..	4 10 11
541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅜–12¼	..	6 10 8
1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.	98⅜–99⅜	..	4 10 6
529,705	Stk.	June 27	3½	Do. 3½ p.c. Deb.	83½–84½	..	4 2 10
55,940	10	Aug. 28	7/10/6	North Middlesex 7 p.c.	12½–13½	..	5 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	12⅜–125	..	6 8 0
60,000	5	Sept. 26	10	Ottoman, Ltd.	7⅜–7¾	..	6 1 3
60,000	50	Aug. 14	13	Portsea, Island B	127–130	..	5 0 0
100,000	50	,,	12	Do. C	120–123	..	4 17 7
249,980	5	Oct. 15	8	Primitiva Ord.	5⅜–6¼	..	6 8 0
499,960	5	June 27	5	,, 5 p.c. Pref.	4⅜–5⅛	..	4 17 7
521,600	100	Dec. 1	4	,, 4 p.c. Deb.	92–94	..	4 5 1
346,198	Stk.	June 27	4	River Plate 4 p.c. Deb.	88–90	..	4 8 11
275,000	5	Sept 26	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	11–11½	..	5 4 4
125,000	50	July 1	5	Do. 5 p.c. Deb.	49–51	..	4 18 0
135,000	Stk.	Aug. 28	10	Sheffield A	222–224	..	4 9 8
209,984	,,	,,	10	Do. B	2 1–223	..	4 9 8
523,500	,,	,,	10	Do. C	220–222	..	4 10 1
90,000	10	Oct. 15	7½	South African	9½–10½	..	7 2 10
6,429,895	Stk.	Aug. 14	5/9/4	South Met., 4 p.c. Ord.	109–111	..	4 18 6
1,895,445	,,	July 11	3	Do. 3 p.c. Deb.	72–74	..	4 1 1
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	157–159	..	5 6 11
952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	115–117	..	5 2 7
60,000	,,	,,	5	Do. 5 p.c. Pref.	113–115	..	4 6 11
117,058	,,	June 27	5	Do. 5 p.c. Deb. Stk.	115–117	..	4 5 6
594,740	Stk.	Nov. 13	5	Southampton Ord.	100–103	..	4 17 1
120,000	Stk.	Aug. 14	7⅜	Tottenham A 5 p.c.	137–140	..	5 5 4
543,940	,,	,,	5⅛	and B 3½ p.c.	115–117	..	5 0 5
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	90–92	..	4 7 0
182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96–98	..	5 2 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111–113	..	4 8 6
30,000	Stk.	Aug. 28	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	155–160	..	5 4 8
255,636	,,	,,	6⅝	,, B 3½ p.c.	130–135	..	5 1 10
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c.	111–116	..	5 5 7
98,000	,,	,,	6⅝	Epsom 5 p.c.	115–120	..	5 10 5
88,416	,,	June 27	3	3 p.c. Deb. Stk.	68–70	..	4 5 9

Prices marked * are "Ex-Div."

Progressive Output in Birmingham.—The output of gas in Birmingham during the week ended Thursday, Dec. 18, so the Gas Committee were informed, amounted to 256,287,000 cubic feet. This made a new record; the previous best figures having been for the week ended Dec. 11, when the output was 252,849,000 cubic feet. Previous to that date, the record was 250,658,000 cubic feet for a week during last January. There has been a steady increase in the number of consumers, and also in the consumption of gas, all through the year.

Electrical Vagaries at Eastbourne.—In the last issue of the "JOURNAL," there was recorded a failure of the electric light in one of the districts of Eastbourne; and brief comment was made on a remark by a local paper that "it is not probable that the light will fail again this Christmastide." Curiously enough, a few hours after our paragraph went to press intimation came to hand of another electrical failure in the town—thus completely upsetting the kindly expression of opinion on the part of the local journalist. The second failure was on Monday evening; and the principal thoroughfares suffered. "Some electrical apparatus" opposite the Railway Station flew into the air; but nobody was hurt. A larger area was affected than on the first occasion, which, of course, meant more inconvenience. Those who depended solely on a gas supply, or had gas fitted to their premises as well as electricity, scored heavily. In fact, as a result of the breakdowns, the demands made on the Gas Company for additional supplies are said to have been very considerable. As an instance of the wisdom of not relying entirely on electricity, it may be pointed out that the operating theatre of the Princess Alice Hospital is supplied with gas as well as electricity, and that the advantage of this double supply was realized fully on the Monday, inasmuch as an operation was about to begin when the electric light failed. Much indignation is evinced in the town over the breakdowns; and there is a demand for a searching inquiry into the matter.

London Electric Lighting.—The "Pall Mall Gazette" of yesterday's date, in the course of its "City Notes," says: Apparently the Press is gradually becoming interested in the details of the London electric lighting scheme published in these columns many days ago. And eulogistic comments are being made. Two central facts of interest, as we pointed out on earlier occasions, are that £4,500,000 of fresh capital must be raised by means of new debentures, and that the whole finance of the scheme is based on an estimate that the net profits will be doubled. So far as we can gather, as a result of careful inquiries, scientific people regard that estimate as quite likely to prove really generous. Indeed, criticisms are already being heard, and demands for fuller and more exact data, in order that the scheme may be adequately considered, and the financial details fully weighed. Undoubtedly it would be a good thing to have the electric lighting system unified, and placed in a simple position for handling by the London County Council when the period of expropriation arrives. But some critics doubt whether the experience of consumers under the Water Board will not be the experience of the user of electric light—whether, in fact, the public will always be the gainer. It is possible that the London County Council, if it came to terms—and it is in a position to look after its interests very closely—might secure somewhat favourable results for itself. . . . There has been a meeting of the directors of the various undertakings with the promoting interests, and apparently it did not forward matters very much. Still, it is early yet to discuss details, and we must wait for further developments.

The Summerseat Gas Company, Limited, has been registered with a capital of £2500, in £1 shares.

Gas engineers and the "Selas" Gas Lighting Company will be a little tickled to learn that the "Electrical Review" has informed its readers that the Belfast Board of Guardians have referred the recommendation of the Watch Committee that the Workhouse be lighted "by electricity on the 'Selas' system," at a cost of £4000, to its Engineer for report.

Another industry is about to be introduced into the Manchester district—viz., the manufacture of portland cement. Mr. B. Carrington Sellars, of the East Lancashire Chemical Company, has acquired the works and land, covering 14 acres, at Fairfield lately belonging to Sir Edmund Buckley. He is at present engaged in reconstructing them, and is putting down boilers and plant of the latest type The raw materials of the cement will be lime from the Buxton district, and shale, which is obtained in Manchester. The cement already produced from these materials has proved to be of excellent quality.

APPLICATIONS FOR LETTERS PATENT.

28,893.—ALPINE MASCHINENFABRIK G.M.B.H. (VORM. HOLZHÄUR'SCHE MASCHINENFABRIK G.M.B.H.), and MEYER, F. M., "Producing fixed gases." Dec. 15.
28,941.—FRANCK, L., "Producing pressure-proof coke, containing a minimum of detrimental sulphur constituents." Dec. 15.
28,964.—RIPPER, C. A., "Gas stove or range." Dec. 16.
29,013.—ROGERS, F. H., "Lighting and extinguishing gas-burners." A communication from Léon Radet. Dec. 16.
29,036.—HILL, J. K., "Liquid meters." Dec. 16.
29,047.—SOUTH METROPOLITAN GAS COMPANY and EVANS, E. V., "Recovering nitrogen of the hydrocyanic acid in crude coal gas." Dec. 16.
29,050.—BOWLEY, W. H. K., "Flexible metallic tubing," Dec. 16.
29,076.—SIMCOCK, H., "Connecting unions or caps and linings to lead and other piping." Dec. 17.
29,088-9.—WOLLASTON, T. R., "Producer-gas generators." Dec. 17.
29,100.—KNOWLES, A. E, "Production of hydrogen, or increasing the percentage of hydrogen in coal gas." Dec. 17.
29,114.—LORD, J., and RUSSELL, W. A., "Gas-burners," Dec. 17.
29,139.—MASCHINENFABRIK AUGSBURG-NÜRNBERG AKT.-GES., "Valves for high-speed compressors." Dec. 17.
29,141.—TOURTEL, J. M., "Regulating-valve." Dec. 17.
29,147.—BAKER, E. A., "Globes." Dec. 17.
29,170.—CARR, M., "Regulating, governing, and maintaining the pressure of gas." Dec. 18.
29,316.—KENT, W. G., and HOWDEN, E. W., "Fluid meters." Dec. 19.
29,323.—ROOKE, T., "Gas-meters." Dec. 19.
29,360.—RICHMOND GAS STOVE AND METER COMPANY, LTD., HARTLEY, H., and HALL, J. T., "Gas-regulating appliance for fires, &c." Dec. 20.
29,381.—DODD, W., "Gas-producers," Dec. 20.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER. Harrogate Gas Company. Applications by Jan. 13.
GENERAL FOREMAN. Kendal Gas Department.
YOUNG MAN FOR SHOW-ROOM. Ilfracombe Gas Company.

Appointments, &c., Wanted.

EXPERIMENTAL CHEMIST. No. 5829.

Stocks and Shares.

TENDRING HUNDRED WATER COMPANY. London Mart. Jan. 20.
SOUTHEND WATER COMPANY. London Mart. Jan. 20.

Meetings.

COMMERCIAL GAS COMPANY. Cannon Street Hotel. Feb. 5. Twelve o'clock.

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RETORTS AND MOUTHPIECES. Newcastle-on-Tyne Gas Company.

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SALFORD GAS DEPARTMENT.

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SHEFFIELD GAS COMPANY. Tenders by Jan. 6.

Sulphuric Acid.

DEAL AND WALMER GAS COMPANY. Tenders by Jan. 6.

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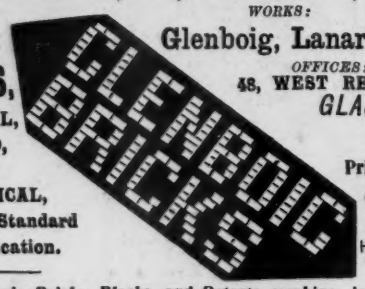

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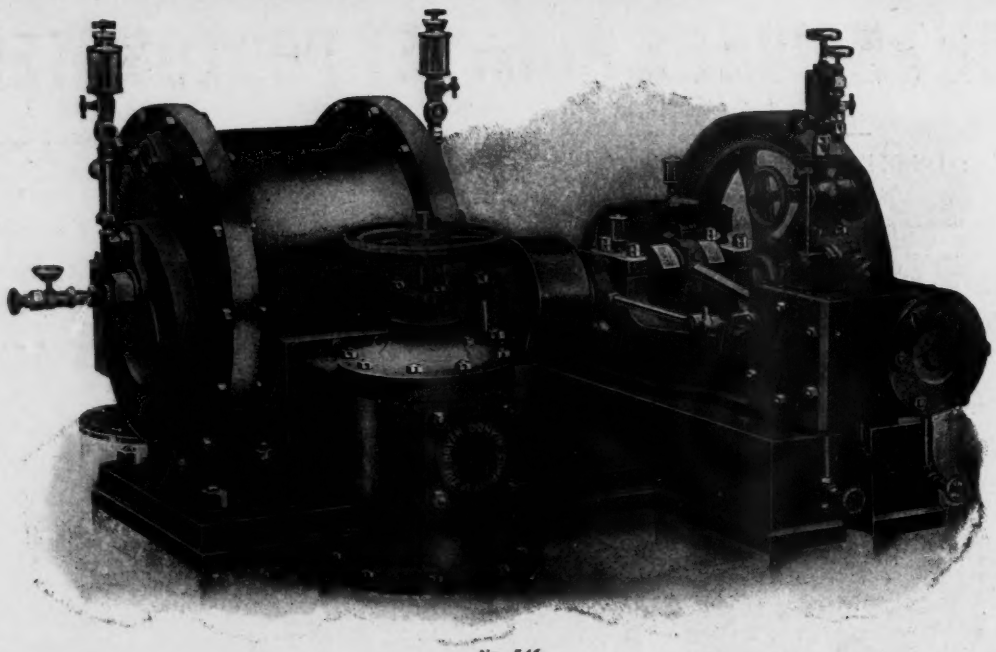

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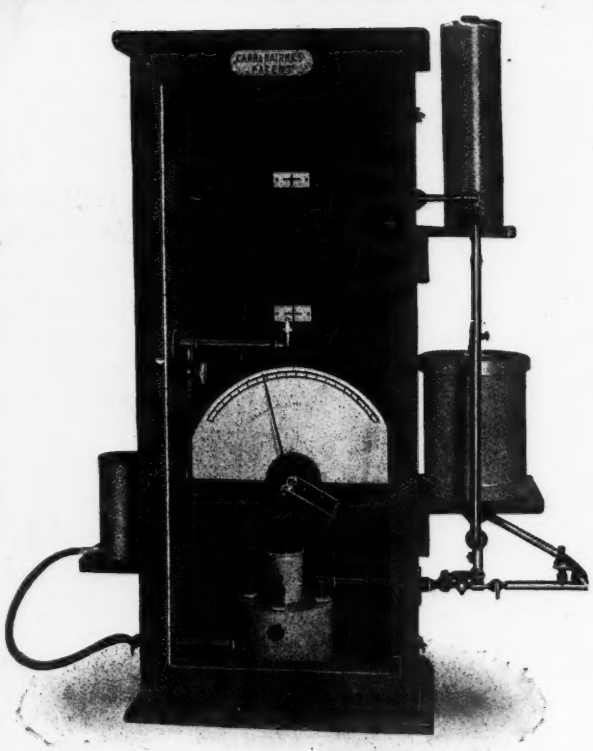

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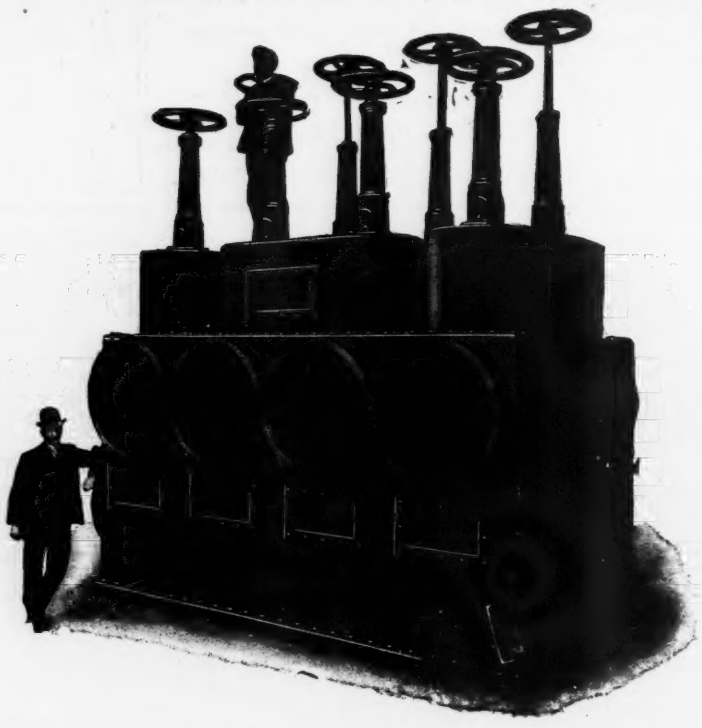

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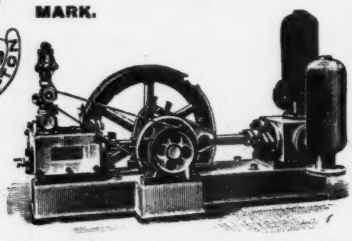

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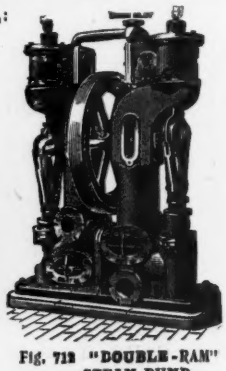

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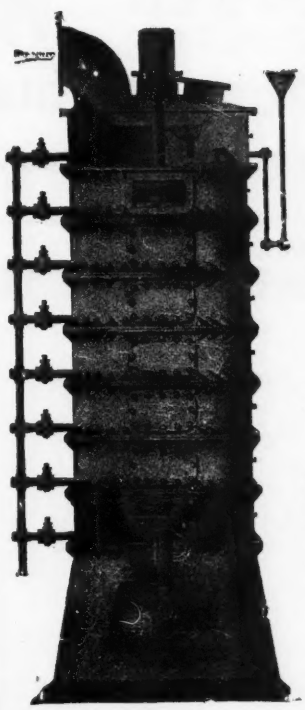

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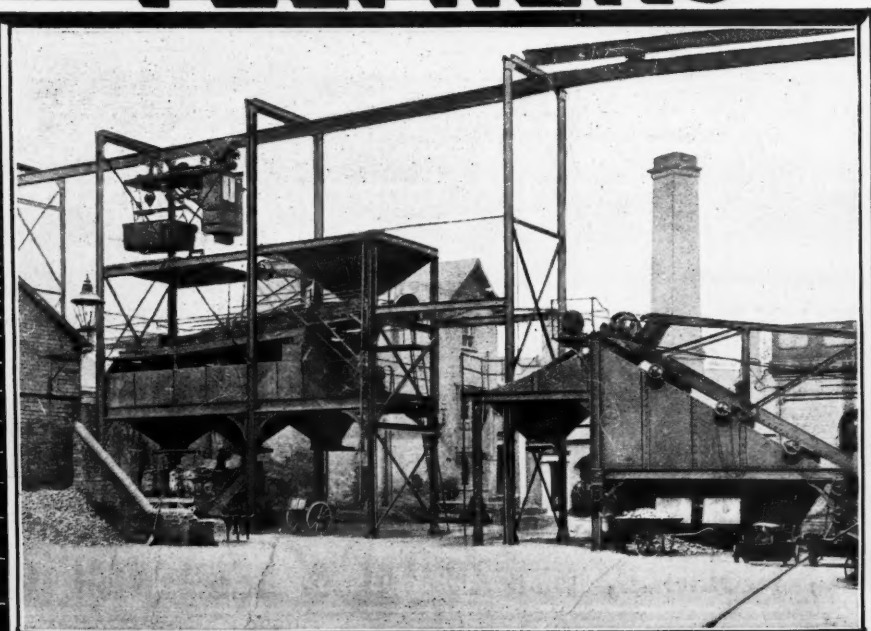

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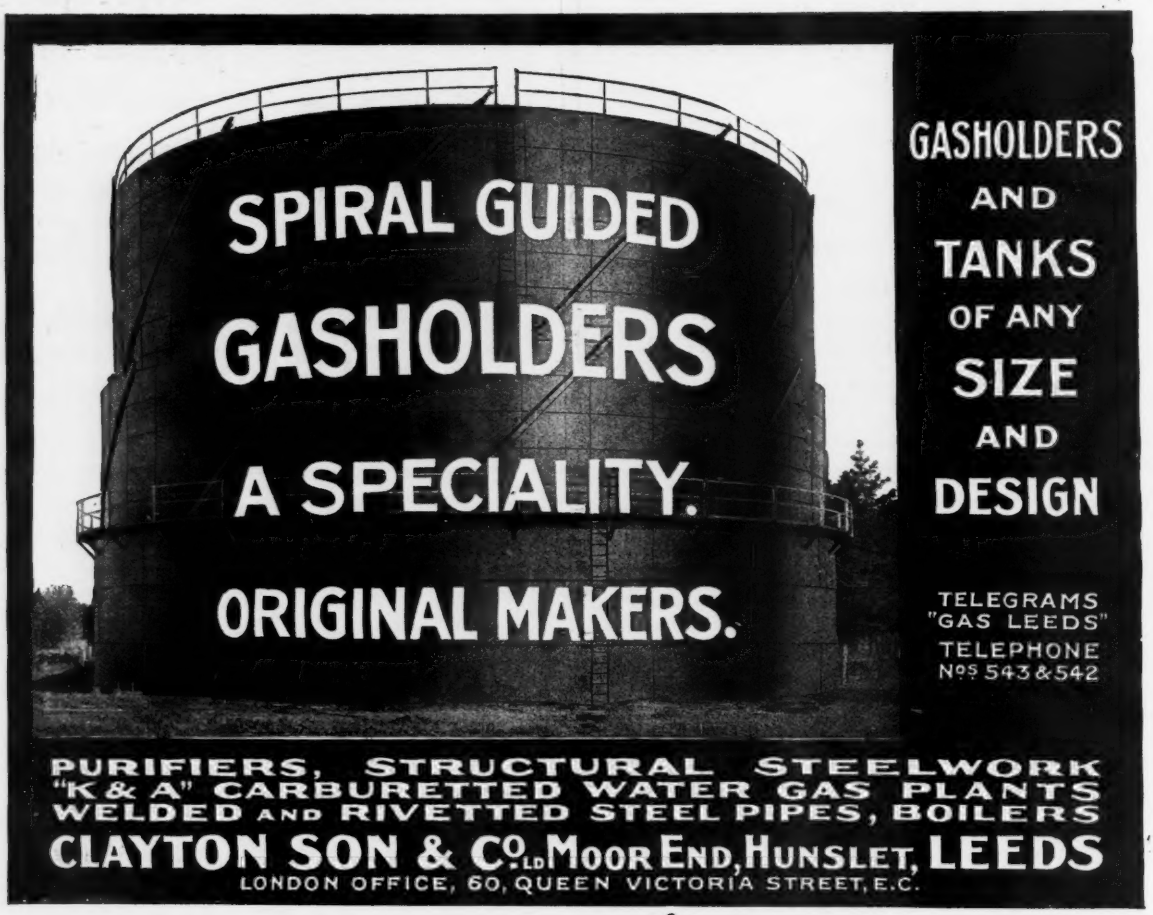
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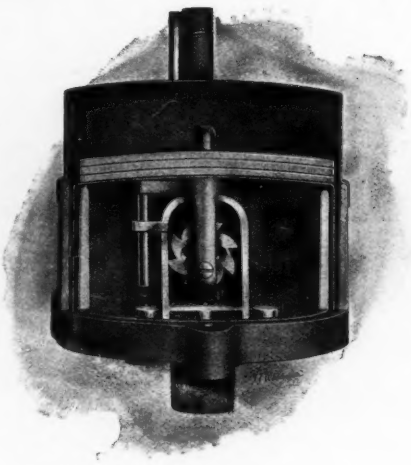

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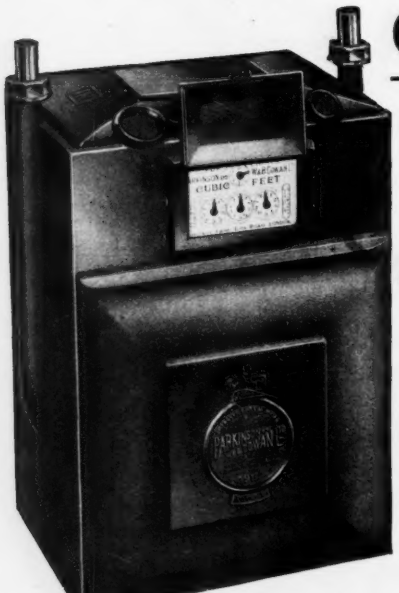

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(GAS DEPARTMENT.)

TENDERS are invited for the Supply of RETORTS, FIRE-BRICKS, &c., required during the ensuing Twelve Months.
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T. WADDOM,
Secretary.

Chief Office:
35, Grainger Street West,
Newcastle-upon-Tyne, Oct. 6, 1913.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas-Works Committee of the Rotherham Corporation are prepared to receive TENDERS for the Supply of RETORTS and FIRE-CLAY GOODS.

Specifications, Quantities, and Forms of Tender may be obtained on Application to the undersigned.

The Person whose Tender is accepted will be required to enter into a Contract which will contain the usual Fair-Wages Clause.

Tenders, endorsed "Tender for Retorts and Fire-Clay Goods," must be sent to the Town Clerk, Town Hall, Rotherham, not later than Monday, the 19th of January, 1914.

By order,
J. S. NAYLOR,
Engineer and General Manager.

DEAL AND WALMER GAS COMPANY.

THE Directors invite Tenders for the Supply of SULPHURIC ACID, for the Manufacture of Sulphate of Ammonia, during One or Three Years from the 1st of January, 1914. Specific Gravity to be stated.

The Acid to be Delivered free to Deal Station. Sellers to pay Carriage on returned Empty Carboys.

Estimated yearly quantity, 80 Tons.

Tenders, addressed to the Chairman, to be sent not later than the 6th of January, 1914.

The Directors do not bind themselves to accept the lowest or any Tender.

Gas Offices, Cannon Street, Deal,
Dec. 24, 1913.

TO STEEL PIPE MANUFACTURERS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the Supply and Delivery of 30-inch, 24-inch, and 20-inch diameter STEEL GAS-MAINS for their Grimesthorpe Works.

Specification, Drawings, and Form of Tender may be obtained upon Application to the Engineer, Mr. J. W. Morrison, M.Inst.C.E., at the Company's Offices, Commercial Street, Sheffield.

The Directors do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Steel Mains," must be Delivered to Mr. Hanbury Thomas, Managing-Director, not later than the First Post on Tuesday, Jan. 6, 1914.

WM. HAMBY,
Secretary.

Commercial Street, Sheffield.
Dec. 12, 1913.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Jan. 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
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THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, so far as they relate to CAPITAL STOCKS, WILL BE CLOSED at Four o'clock p.m. on Tuesday, the 6th day of January next, and WILL BE RE-OPENED immediately after the Half-Yearly Ordinary General Meeting of the Company to be held on Friday, the 6th day of February next.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., Dec. 23, 1913.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 5th of February, 1914, at Twelve o'clock at Noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st of December, 1913; to declare a Dividend; to elect Directors and an Auditor in the place of those retiring.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 7th of January to the 5th of February next, both days inclusive; and the Dividends will be paid on the 16th of February next to the holders of Stock registered at the date of the closing.

By order of the Board,
F. J. BRADFIELD,
Secretary.

Offices: Stepney,
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[Illustrated Advertisement, Dec. 16, p. 852.]

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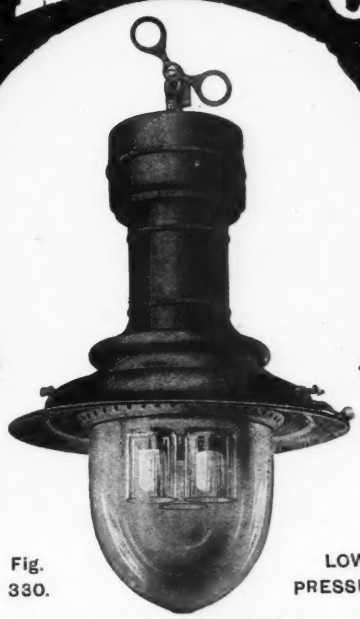

Fig. 330. LOW-PRESSURE HIGH-POWER LAMP.

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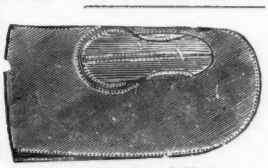

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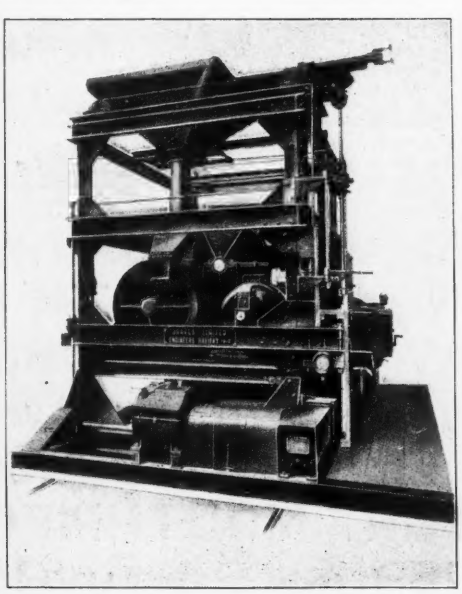

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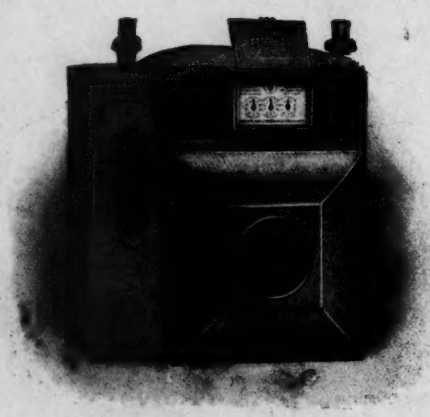

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